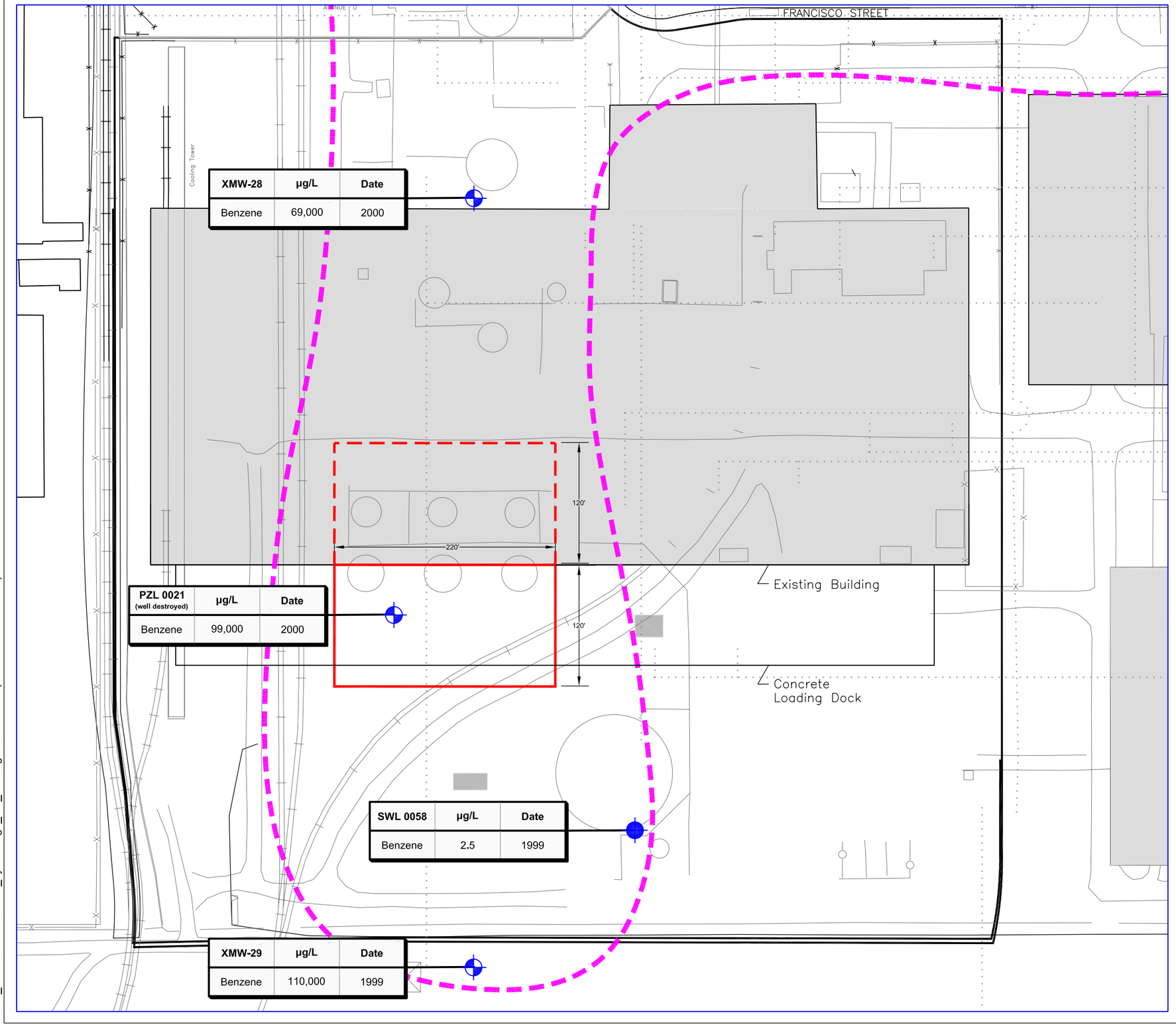
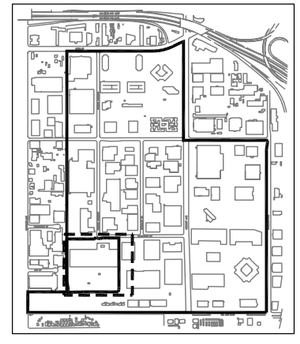
SOURCE AREA 9



Legend

- *Assumed extent of NAPL source area based on Benzene concentrations in one or more water table monitoring wells and location of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Approximate location of former underground pipelines with a potential to have transported VOC-containing fluids*
- *Parcel boundary*
- *Outlines of historical features with use/contents indicated*
- *Monitoring well location in water table zone with contaminant concentration and date of sample*
- *Monitoring well location in Middle Bellflower C-sand zone.*



Area shown in this map

N

0 100 200

Scale in Feet

FIGURE 7.6-1

ASSUMED EXTENT OF NAPL CONTAMINATION
Parcel No. 7351-034-058

Source Area 9
Del Amo Soil + NAPL FS

URS

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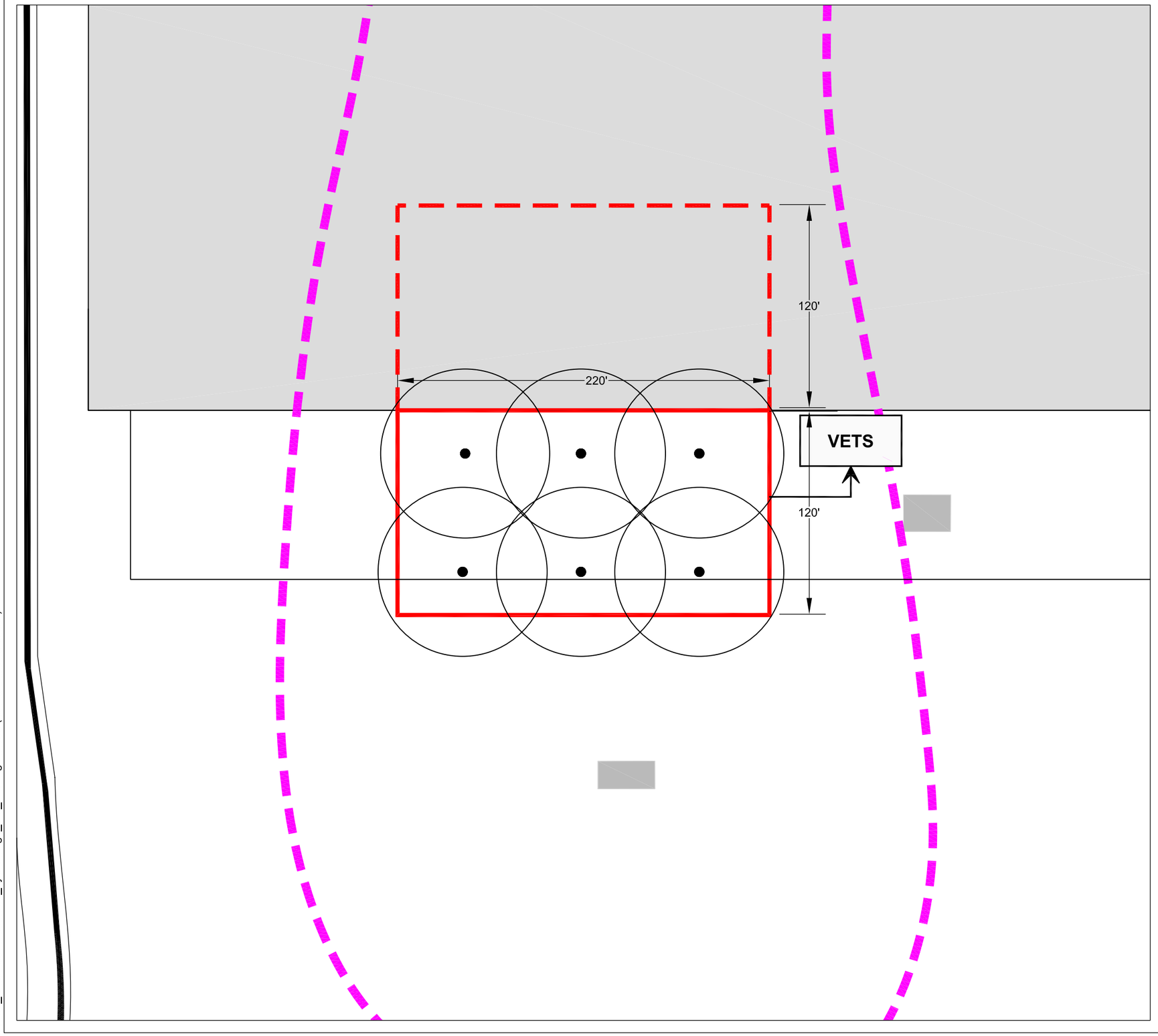

Legend

- *Assumed extent of NAPL source area based on Benzene concentrations in one or more water table monitoring wells and location of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *SVE/BV vertical well (70-foot spacing), circle denotes assumed 50-foot radius of influence*
- VETS — *Vapor Extraction Treatment System*

N

0 60 120

Scale in Feet

FIGURE 7.6-2

Alternative 3
SOIL VAPOR EXTRACTION/BIOVENTING, ICS AND MONITORING
Parcel No. 7351-034-058

Source Area 9
Del Amo Soil + NAPL FS

URS

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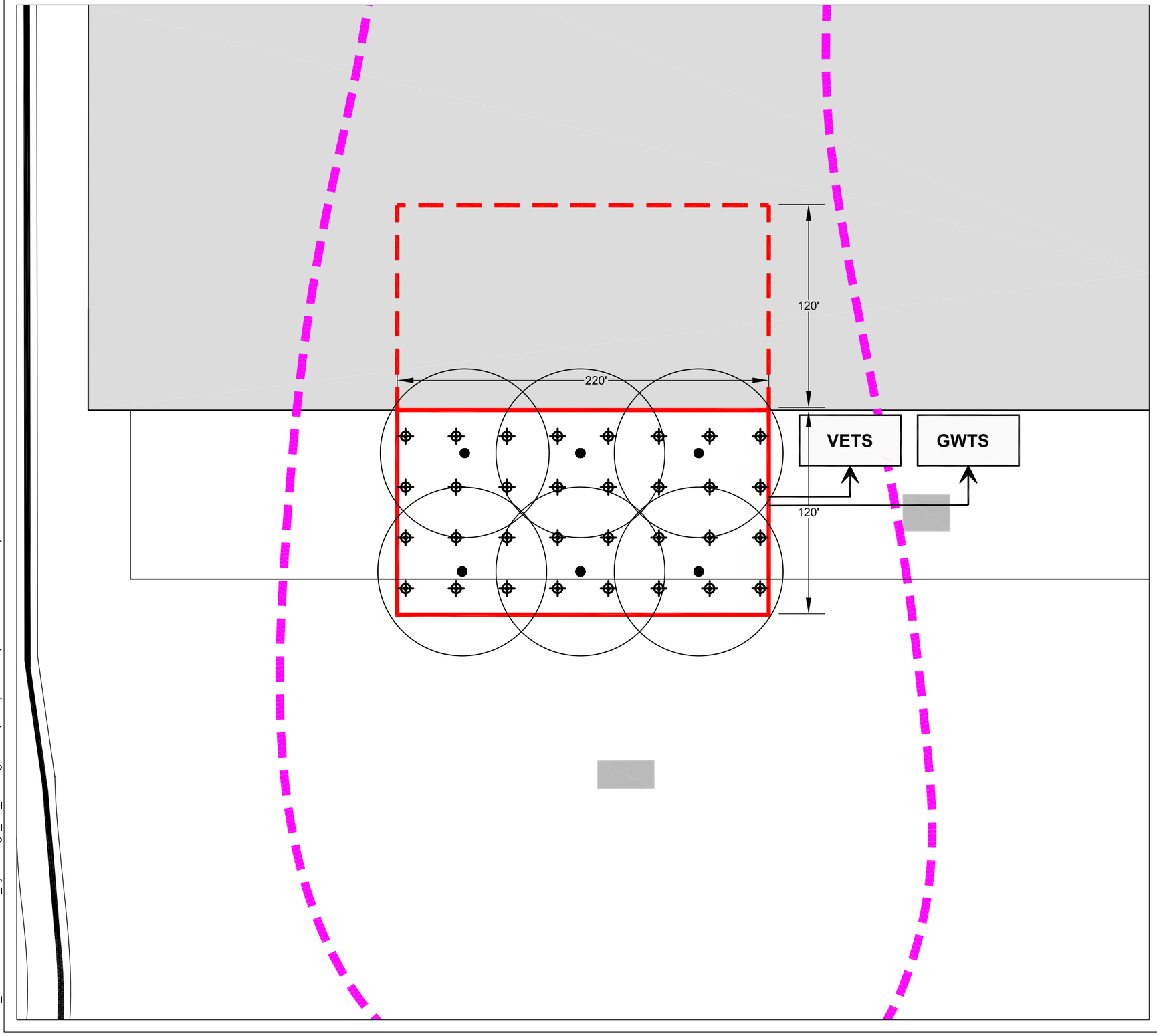

Legend

- *Assumed extent of NAPL source area based on Benzene concentrations in one or more water table monitoring wells and location of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *Groundwater Extraction Well (30-foot spacing)*
- *SVE/BV vertical well (approximate 70-foot spacing)*
- VETS — *Vapor Extraction Treatment System*
- GWTS — *Groundwater Treatment System*

N

0 60 120

Scale in Feet

FIGURE 7.6-3

Alternative 4
HYDRAULIC EXTRACTION, SVE/BV, ICS AND MONITORING
Parcel No. 7351-034-058

Source Area 9
Del Amo Soil + NAPL FS

URS

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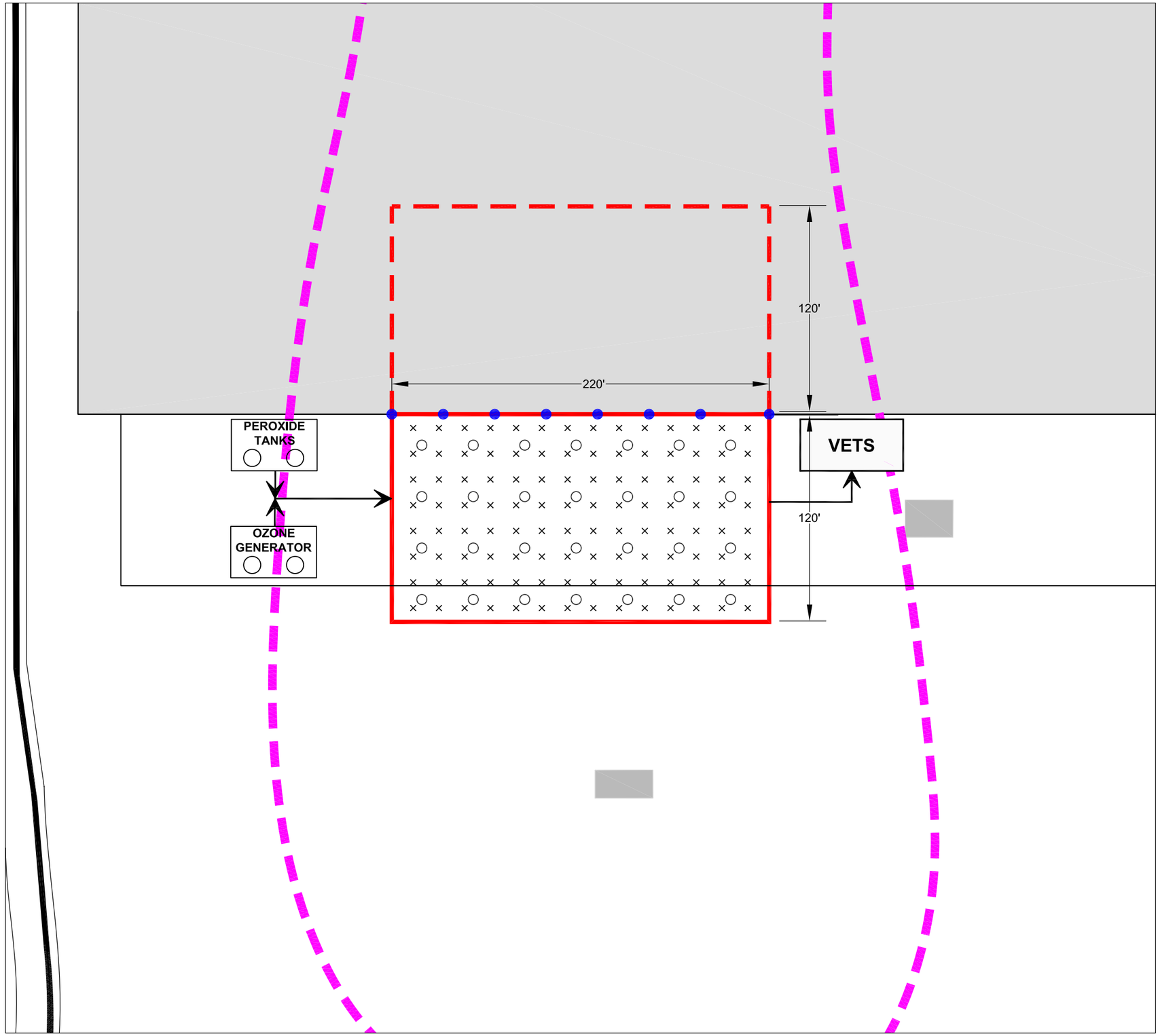

Legend

- Assumed extent of NAPL source area based on Benzene concentrations in one or more water table monitoring wells and location of former facilities
- Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)
- Parcel boundary
- × ISCO injection well (15-foot spacing)
- ● SVE sentry well (30-foot spacing)
- ○ SVE interior well, dual screen (30-foot spacing)
- VETS — Vapor Extraction Treatment System

Notes:

(1) Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.

(2) SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.

N

0 60 120

Scale in Feet

FIGURE 7.6-4

Alternative 5
IN-SITU CHEMICAL OXIDATION, SVE, ICS AND MONITORING
Parcel No. 7351-034-058

Source Area 9
Del Amo Soil + NAPL FS

URS

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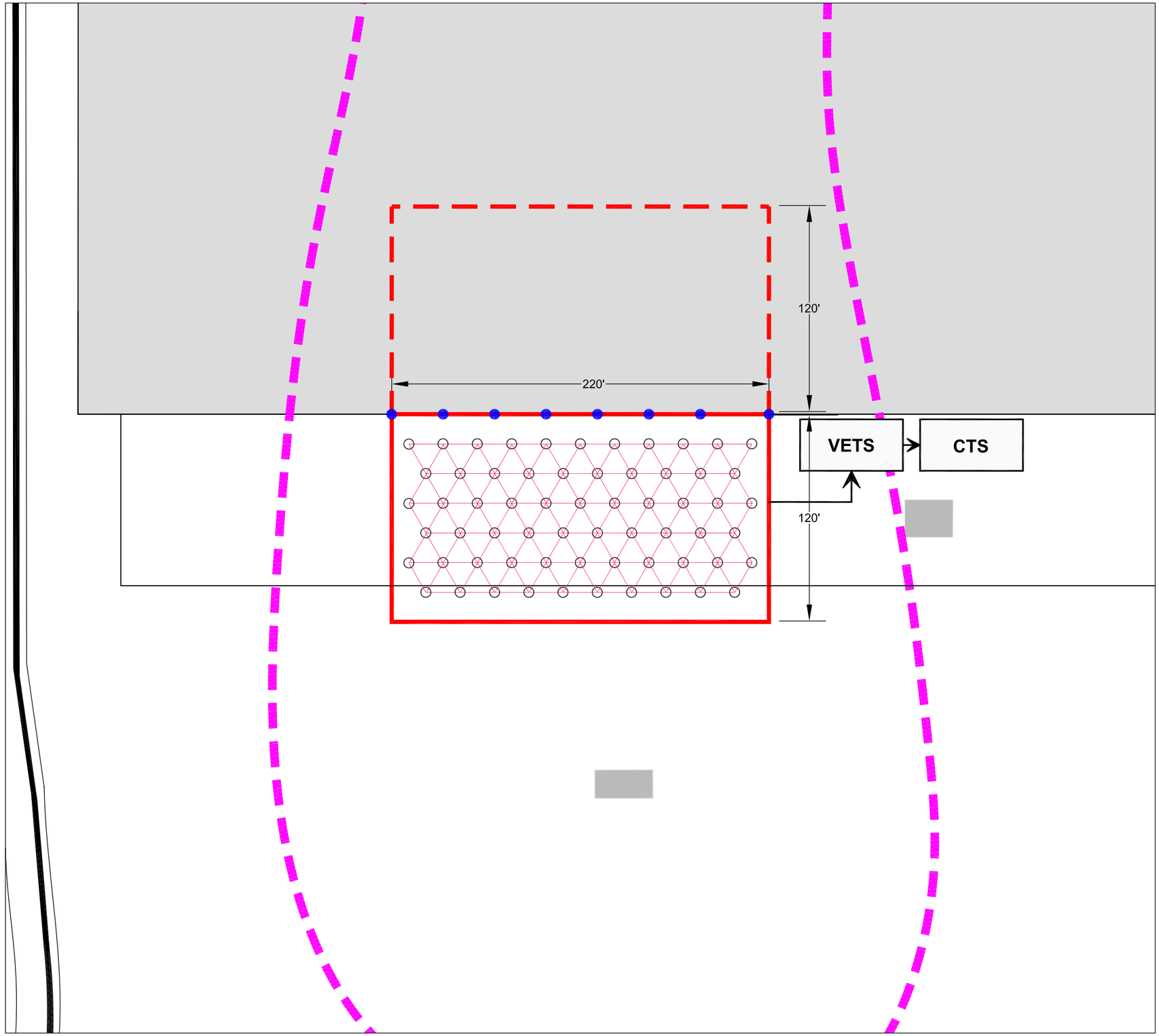

Legend

- *Assumed extent of NAPL source area based on Benzene concentrations in one or more water table monitoring wells and location of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *SVE sentry well (30-foot spacing)*
- *ERH electrode and SVE interior well, dual screen (20- foot spacing)*
- **VETS** — *Vapor Extraction Treatment System*
- **CTS** — *Condensate Treatment System*

Notes:

(1) Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.

(2) SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.

N

0 60 120

Scale in Feet

FIGURE 7.6-5

Alternative 6
IN-SITU SOIL HEATING, SVE, ICS AND MONITORING
Parcel No. 7351-034-058

Source Area 9
Del Amo Soil + NAPL FS

URS

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TABLE E.5-1
SOURCE AREA 9 - REMEDIAL ALTERNATIVE 2
ICs + MONITORING COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	ICs Design, Documentation, Implementation	1	ls	$ 34,110	$ 34,110
				Direct Capital Total	**$ 34,000**
Item No.	**Indirect Capital Costs**				
1	Project Management	10%	of	$ 34,000	$ 3,400
				Indirect Capital Subtotal	**$ 3,400**
				Total Direct + Indirect Capital Cost	**$ 37,400**
Item No.	**Operation and Maintenance Costs**				
1	Institutional Controls, Inspections, Monitoring	1	year	$ 3,275	$ 3,275
2	Groundwater Monitoring	1	year	$ 15,000	$ 15,000
				ICs Annual Operation and Maintenance Subtotal	**$ 18,275**
				Present Worth of ICs Operation and Maintenance Costs (5%, 100 Years)	**$ 363,000**
				Contingency (20% of total project cost)	**$ 80,000**
				Total Capital and ICs O&M Cost	**$ 481,000**

NOTES/ASSUMPTIONS
1. ICs include IC layers 1, 2, 3, 4A and 5.
2. ICs capital and O&M costs are estimated based on applicable IC layers per parcel as shown in Tables D3-1 and D3-2.

TABLE E.5-2
SOURCE AREA 9 - REMEDIAL ALTERNATIVE 3
SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 126,000	$ 126,000
2	Mobilization/Demobilization	26,400	sf	$ 1.25	$ 33,000
3	Electrical Service/Hookup/Utilities	1	ls	$ 25,000	$ 25,000
4	Site Preparation/Geophysical	26,400	sf	$ 0.8	$ 22,000
5	SVE Wells	6	ea	$ 5,500	$ 33,000
6	Well Headworks/Vault (24" traffic rated)	6	ea	$ 3,000	$ 18,000
7	VETS Installation and Startup	1	ls	$ 90,000	$ 90,000
8	SVE Blower + Thermal Oxidizer; 300 cfm	1	ls	$ 75,000	$ 75,000
9	Control and Instrumentation	1	ls	$ 6,000	$ 6,000
10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$ 15,000	$ 15,000
11	Trenching, Piping, Backfill and Resurfacing	500	lf	$ 30	$ 15,000
12	Equipment Pad/Enclosure/Fence	1	ea	$ 20,000	$ 20,000
13	Post Treatment Sampling + Analysis	11	borings	$ 5,000	$ 55,000
				Direct Capital Total	**$ 533,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 533,000	$ 64,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 533,000	$ 32,000
3	Contruction Management	8%	of	$ 533,000	$ 43,000
				Indirect Capital Subtotal	**$ 139,000**
				Total Direct + Indirect Capital Cost	**$ 672,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 7,000	$ 84,000
2	Electricity: SVE blower, misc equip	12	mths	$ 2,200	$ 26,400
3	Operations & Maintenance	12	mths	$ 5,000	$ 60,000
4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$ 1,000	$ 12,000
5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 4,000	$ 48,000
6	Project Management/Consultant support/Reports	12	mths	$ 5,000	$ 60,000
7	Waste/NAPL/Water Disposal	12	mths	$ 2,000	$ 24,000
8	Health & Safety/Air Monitoring	1	ls	$ 3,000	$ 3,000
9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 3,000	$ 36,000
				SVE Annual Operation and Maintenance Subtotal	**$ 354,000**
				SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)	**$ 1,256,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of SVE)	**$ 386,000**
				Total Capital and O&M Cost Present Worth	**$ 2,795,000**

NOTES/ASSUMPTIONS
1. SVE (OS) system: Uses 6 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 300 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.

TABLE E.5-3
SOURCE AREA 9 - REMEDIAL ALTERNATIVE 4
HYDRAULIC EXTRACTION AND SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 126,000	$ 126,000
2	Mobilization/Demobilization	26,400	sf	$ 1.25	$ 33,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical	26,400	sf	$ 0.8	$ 22,000
5	SVE Vertical Wells	6	ea	$ 6,000	$ 36,000
6	Groundwater Extraction Wells	32	ea	$ 9,500	$ 304,000
7	Well Headworks/Vault/Extraction Pumps (24" traffic rated)	38	ea	$ 3,000	$ 114,000
8	Treatment System Installation and Startup (SVE + Hyd Ext)	1	ls	$ 120,000	$ 120,000
9	SVE Blower + Thermal Oxidizer; 600 cfm	1	ls	$ 90,000	$ 90,000
10	Control and Instrumentation	1	ls	$ 24,000	$ 24,000
11	Advanced Oxidation Treatment system (32 gpm) (HiPOx)	1	ls	$ 226,000	$ 226,000
12	Air Stripping Unit+Blower (STAT 80)	1	ls	$ 17,000	$ 17,000
13	Carbon Adsorption Vessels - VPGAC and LPGAC	4	ls	$ 10,000	$ 40,000
14	Misc Treat System: OWS, Tanks, Piping, Pumps	1	ls	$ 55,000	$ 55,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	2,100	lf	$ 30	$ 63,000
16	Equipment Pad/Enclosure/Fence	1	ea	$ 30,000	$ 30,000
17	Post Treatment Sampling + Analysis	11	borings	$ 5,000	$ 55,000
				Direct Capital Total	**$ 1,395,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 1,395,000	$ 168,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 1,395,000	$ 84,000
3	Contruction Management	8%	of	$ 1,395,000	$ 112,000
				Indirect Capital Subtotal	**$ 364,000**
				Total Direct+Indirect Cost	**$ 1,759,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel:Natural Gas (Thermal oxidizer)	12	mths	$ 10,000	$ 120,000
2	Electricity (SVE blower, HiPOx, Air Stripper blower)	12	mths	$ 11,500	$ 138,000
3	Operations & Maintenance	12	mths	$ 10,000	$ 120,000
4	Chemicals for HiPOx: H2O2	12	mths	$ 12,000	$ 144,000
5	Carbon - Liquid Phase	12	mths	$ 2,000	$ 24,000
6	Carbon - Vapor Phase (post-thermal/catox)	12	mths	$ 4,000	$ 48,000
7	Groundwater/Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 10,000	$ 120,000
8	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
9	Waste/NAPL/Water Disposal	12	mths	$ 4,000	$ 48,000
10	Health & Safety/Air Monitoring	1	ls	$ 6,000	$ 6,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 5,000	$ 60,000
				SVE Annual Operation and Maintenance Subtotal	**$ 429,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,522,000**
				Hydraulic Extraction Annual Operation and Maintenance Subtotal	**$ 496,000**
				Present Worth of Hydraulic Extraction Operation and Maintenance Costs (5%, 10 Years)	**$ 3,830,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of Hydraulic Extraction)	**$ 1,423,000**
				Total Capital and O&M Cost Present Worth	**$ 9,015,000**

NOTES/ASSUMPTIONS

1. SVE (OS) system: Uses 6 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 600 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. Hydraulic extraction system: Uses 32 groundwater extraction wells, 50-80 feet bgs screens with a max extraction flow rate of 32 gpm.
5. Water is treated by oil-water separator (OWS), APT's HiPOx (H2O2+Ozone) system and air stripping with discharge to storm drain.
6. Liquid phase carbon is used as a backup or polishing treatment process. Assumes 2 carbon changeouts per month.
7. Assume hydraulic extraction operation for 10 years.
8. Vapor phase carbon is used after SVE operation is completed to treat air stripper discharge. Assumes 1 carbon changeout/month.
9. Groundwater is extracted from UBF/MBF and some wells are expected to go dry.

TABLE E.5-4
SOURCE AREA 9 - REMEDIAL ALTERNATIVE 5
IN-SITU CHEMICAL OXIDATION AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 301,360	$ 301,360
2	Mobilization/Demobilization	26,400	sf	$ 1.5	$ 40,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical survey	26,400	sf	$ 0.8	$ 22,000
5	Chemical Injection Well Points	336	ea	$ 4,200	$ 1,412,000
6	Vapor Extraction Interior Wells (outdoor)	28	ea	$ 6,500	$ 182,000
7	Vapor Extraction Sentry Wells (outdoor)	8	ea	$ 6,500	$ 52,000
8	Temperature Monitoring Points/Wells (outdoor)	16	ea	$ 10,000	$ 160,000
9	Well Headworks/Vault - Injection Wells (36-inch traffic rated)	112	ea	$ 4,000	$ 448,000
10	Well Headworks/Vault - SVE/Monit. Wells (24-inch traffic rated)	52	ea	$ 3,000	$ 156,000
11	Treatment System Installation and Startup	1	ls	$ 125,000	$ 125,000
12	Misc. Treatment Sys Equipment: tanks, piping..	1	ls	$ 50,000	$ 50,000
13	SVE Equipment : 1,000 CFM Blower+ThermOx	1	ls	$ 100,000	$ 100,000
14	Ozone Generation System, 80 ppd (air supply, generator, and manifold system)	1	units	$ 280,000	$ 280,000
15	Control and Instrumentation (includes ozone / peroxide distribution manifold and controls)	1	ls	$ 55,900	$ 55,900
16	Trenching, Piping, Backfill and Resurfacing	2,900	lf	$ 50	$ 145,000
17	Equipment Pad/Enclosure/Fence	1	ea	$ 40,000	$ 40,000
18	Post Treatment Sampling + Analysis	11	borings	$ 5,000	$ 55,000
				Direct Capital Total	**$ 3,664,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	8%	of	$ 3,664,000	$ 294,000
2	Project Management, Agency Reporting/Coordination	5%	of	$ 3,664,000	$ 184,000
3	Contruction Management	6%	of	$ 3,664,000	$ 220,000
				Indirect Capital Subtotal	**$ 698,000**
				Total Direct + Indirect Capital Cost	**$ 4,362,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal oxidizer)	12	mths	$ 15,000	$ 180,000
2	Electricity: (SVE Blower, Ozone Gen, misc electrical equip)	12	mths	$ 12,000	$ 144,000
3	SVE System Operation and Monitoring Labor	12	units	$ 10,000	$ 120,000
4	SVE Maintenance Materials and Expenses	12	mths	$ 4,000	$ 48,000
5	Chemicals: H2O2 (refer to note 5)	112	wells	$ 4,000	$ 448,000
6	ISCO Consultant Oversight	12	mths	$ 8,000	$ 96,000
7	SVE Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 5,000	$ 60,000
8	SVE / ISCO Soil and Groundwater Monitoring/Sampling Analytical Lab Costs (semi annually)	2	rounds	$ 50,000	$ 100,000
9	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
10	Waste Disposal	12	mths	$ 5,000	$ 60,000
11	H&S/Air Monitoring	1	ls	$ 8,000	$ 8,000
12	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 8,000	$ 96,000
				SVE Annual Operation and Maintenance Subtotal	**$ 671,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 2,380,000**
				ISCO Annual Operation and Maintenance Subtotal	**$ 786,000**
				Present Worth of ISCO Operation and Maintenance Costs (5%, 2 Years)	**$ 1,462,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ISCO)	**$ 3,282,000**
				Total Capital and O&M Cost Present Worth	**$ 11,967,000**

NOTES/ASSUMPTIONS

1. Assume 28 SVE wells with dual screens 15-30 and 30-60 feet bgs and 8 SVE sentry wells with 15-30 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 1,000 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. ISCO uses 112 direct push injection wells, each well a cluster of three 3/4"-SS injection points screened at 3 depths between 50-80 feet bgs.
5. Assume injection of 4,000 gal of 20% H2O2 per well for 2 year treatment for total of 448,000 gal of H2O2.
6. Assume injection of 300 lbs of O3 per well for 2 year treatment for total of 34,000 lbs. of O3.
7. Assume ISCO treatment system operates continuously for 2-year treatment with a 70% up time equivalent to 511 days.

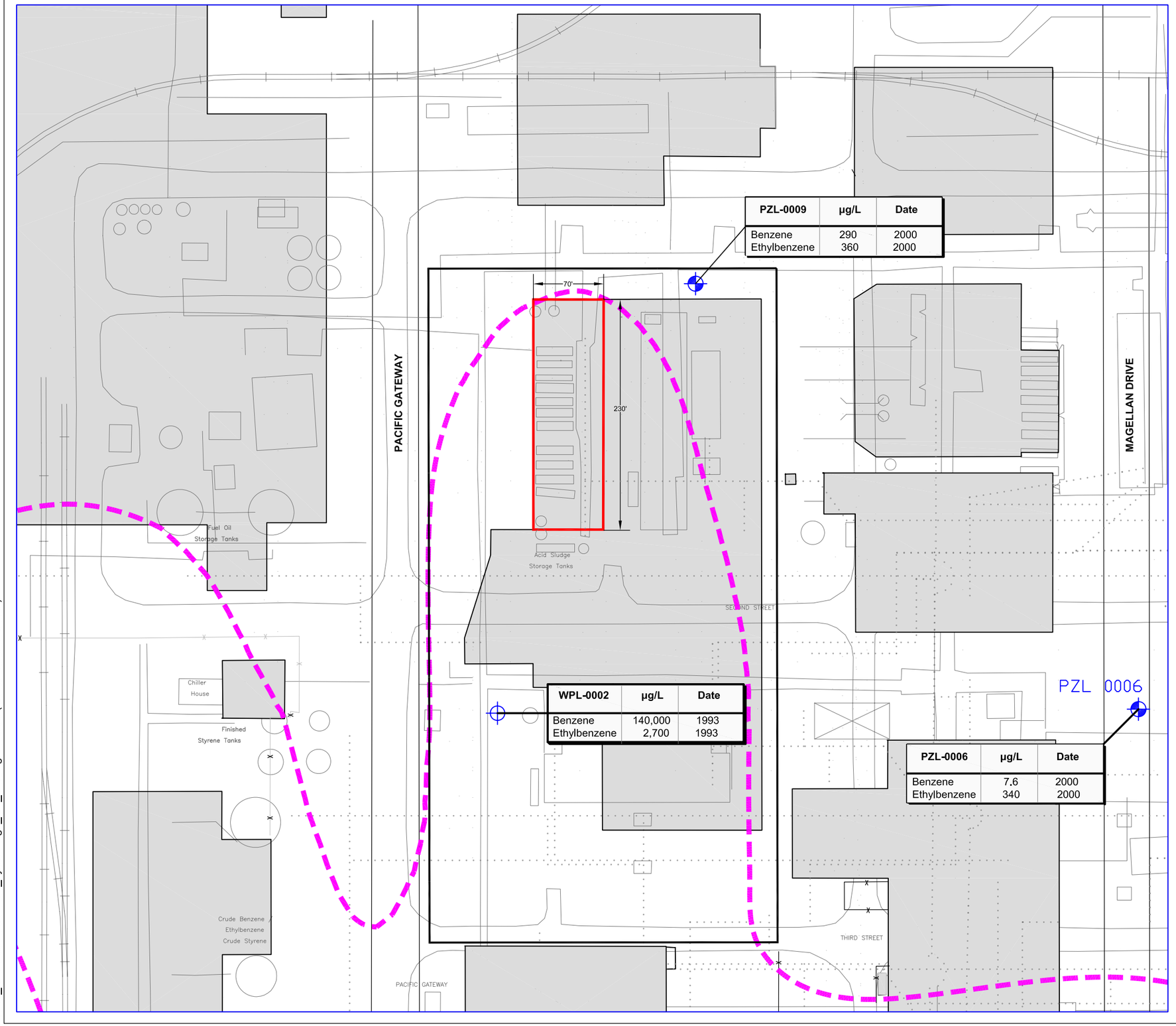
TABLE E.5-5
SOURCE AREA 9 - REMEDIAL ALTERNATIVE 6
IN-SITU SOIL HEATING AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 302,000	$ 302,000
2	Mobilization/Demobilization	26,400	sf	$ 1.5	$ 40,000
3	Electrical Service/Hookup 12kV, 60A, 3Φ	1	ls	$ 50,000	$ 50,000
4	Site Preparation/Geophysical	26,400	sf	$ 0.8	$ 22,000
5	Transformers/Power Controls	1	ls	$ 120,000	$ 120,000
6	Electrode/Vapor Extraction Wells	63	ea	$ 13,000	$ 819,000
7	Vapor Extraction Wells - Sentry	8	ea	$ 6,000	$ 48,000
8	Monitoring Wells	20	ea	$ 10,000	$ 200,000
9	Temperature Monitoring Points/Thermocouples	10	ea	$ 10,000	$ 100,000
10	Well Headworks/Vault (24" traffic rated)	101	ea	$ 3,000	$ 303,000
11	Treatment System Installation and Startup (Vapor and Liquid)	1	ls	$ 160,000	$ 160,000
12	High Vac Blower + Thermal Oxidizer; 2,500 scfm	1	unit	$ 160,000	$ 160,000
13	Control and Instrumentation	1	ls	$ 49,000	$ 49,000
14	Condensed Water Treatment System, 10 gpm (HiPOx, LPGAC)	1	ls	$ 210,000	$ 210,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	3,800	lf	$ 50	$ 190,000
16	Equipment Pad/Enclosure/Fence/Berms/Trailer	1	ea	$ 50,000	$ 50,000
17	PreTreatment Sampling+Analysis (Sampling during well installation)	1	ls	$ 150,000	$ 150,000
18	Post Treatment Sampling + Analysis	11	borings	$ 5,000	$ 55,000
				Direct Capital Total	**$ 3,028,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	8%	of	$ 3,028,000	$ 243,000
2	Project Management, Agency Reporting/Coordination	5%	of	$ 3,028,000	$ 152,000
3	Contruction Management	6%	of	$ 3,028,000	$ 182,000
				Indirect Capital Subtotal	**$ 577,000**
				Total Direct + Indirect Capital Cost	**$ 3,605,000**
Item No.	**Operation and Maintenance Cost**				
1	Electricity - ERH for soil heating	12	units	$ 73,300	$ 879,600
2	Electricity - SVE, HiPOx and misc elec equip	12	units	$ 16,400	$ 197,000
3	Operations & Maintenance	12	mths	$ 30,000	$ 360,000
4	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 33,000	$ 396,000
5	Liquid Phase Carbon	12	mths	$ 4,000	$ 48,000
6	Chemicals for water treatment: H2O2	12	mths	$ 375	$ 5,000
7	Labor - Groundwater/Vapor Treatment System Influent/Effluent Monitoring	12	mths	$ 16,000	$ 192,000
8	Project Management/Consultant Support/Reports	12	mths	$ 15,000	$ 180,000
9	Waste/NAPL/Water Disposal	12	mths	$ 6,000	$ 72,000
10	Health & Safety/Air Monitoring	12	mths	$ 8,000	$ 96,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 10,000	$ 120,000
				SVE + ERH Annual Operation and Maintenance Subtotal	**$ 2,546,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 2 Years)	**$ 4,735,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ERH)	**$ 3,336,000**
				Total Capital and O&M Cost Present Worth	**$ 12,157,000**

NOTES/ASSUMPTIONS

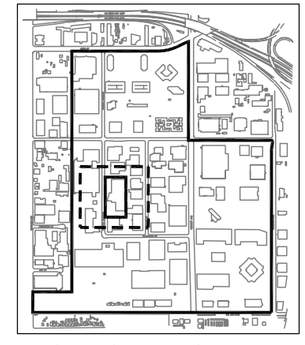
1. Assume 63 electrode SVE wells with dual conductive interval 25-55 and 60-80 ft bgs, dual-completed SVE with 15-30 and 30-50 ft bgs screens.
2. Assume 8 SVE sentry wells with 15-30 feet bgs screens.
3. Vapor treatment system uses thermal oxidizer, 2,500 scfm, positive displacement (PD) blower.
4. Condensate treatment system designed to treat 10 gpm using APT's HiPOx (H2O2+O3) system and LPGAC with discharge to storm drain.
5. Assume ERH+SVE operation for 2 years.
6. Assume average power usage of 489,000 KWhr/month and total electrical energy of 11.8 million KWhr for soil heating.
7. Assume system heating time on average of 50% of days in year.
8. Power conditioning unit (transformer) assumed to be rented.

SOURCE AREA 4



Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Approximate location of former underground pipelines with a potential to have transported VOC-containing fluids*
- *Parcel boundary*
- *Outlines of historical features with use/contents indicated*
- *Monitoring well location in water table zone with contaminant concentration and date of sample*
- *Temporary well point with historical data*



Area shown in this map

N

0 100 200

Scale in Feet

FIGURE 7.7-1

ASSUMED EXTENT OF NAPL CONTAMINATION
Parcel No. 7351-034-069

Source Area 4
Del Amo Soil + NAPL FS

URS

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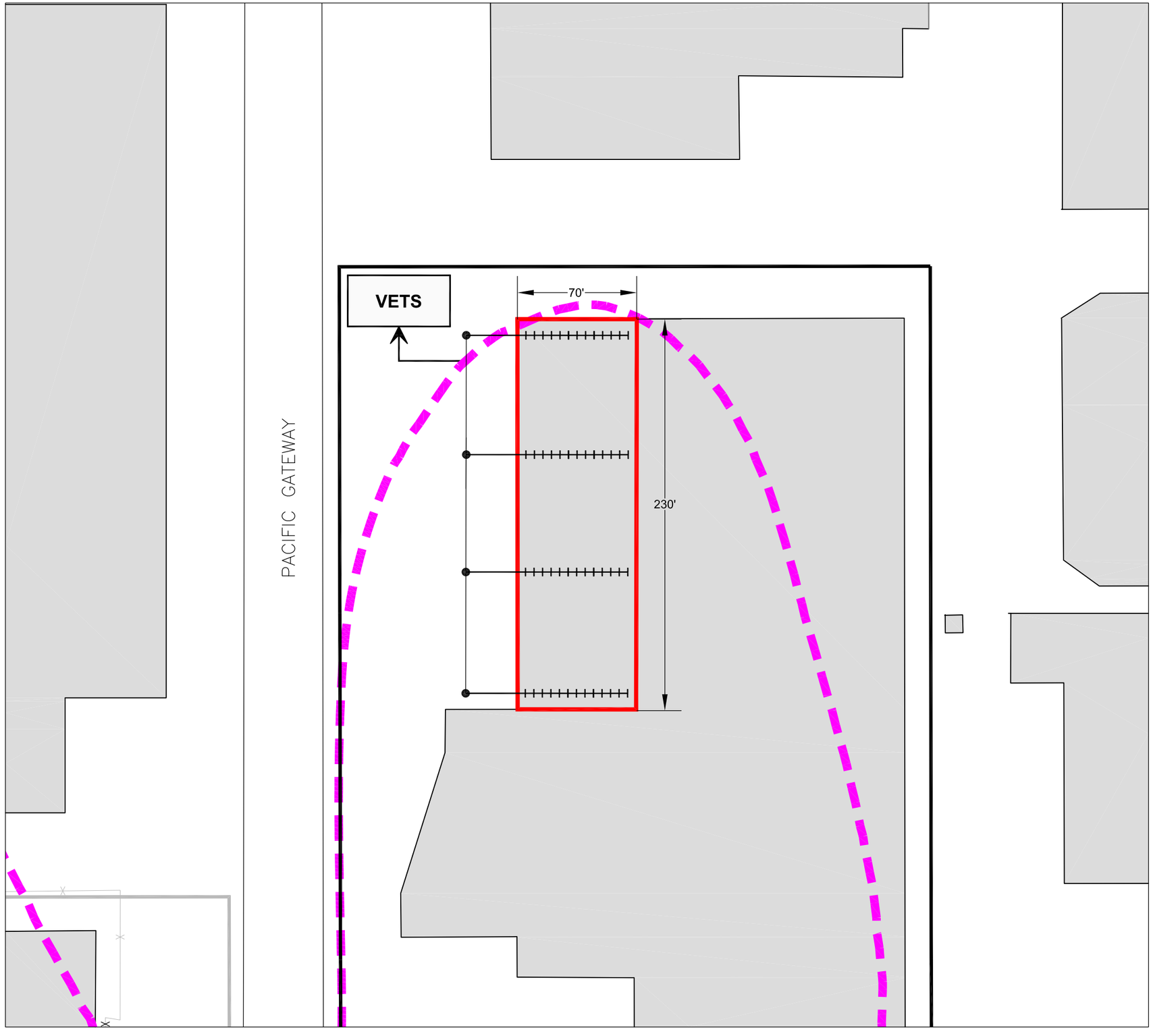

Legend

- *Assumed extent of NAPL source area based on benzene concentrations in one or more water table monitoring wells and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- VETS — *Vapor Extraction Treatment System*
- *Horizontal SVE/BV well (70-foot spacing) for deep soil under building (approximately 30-35 feet bgs)*

N

0 60 120

Scale in Feet

FIGURE 7.7-2

Alternative 3
SOIL VAPOR EXTRACTION/BIOVENTING, ICS AND MONITORING
- HORIZONTAL WELLS
Parcel No. 7351-034-069
Source Area 4
Del Amo Soil + NAPL FS

URS

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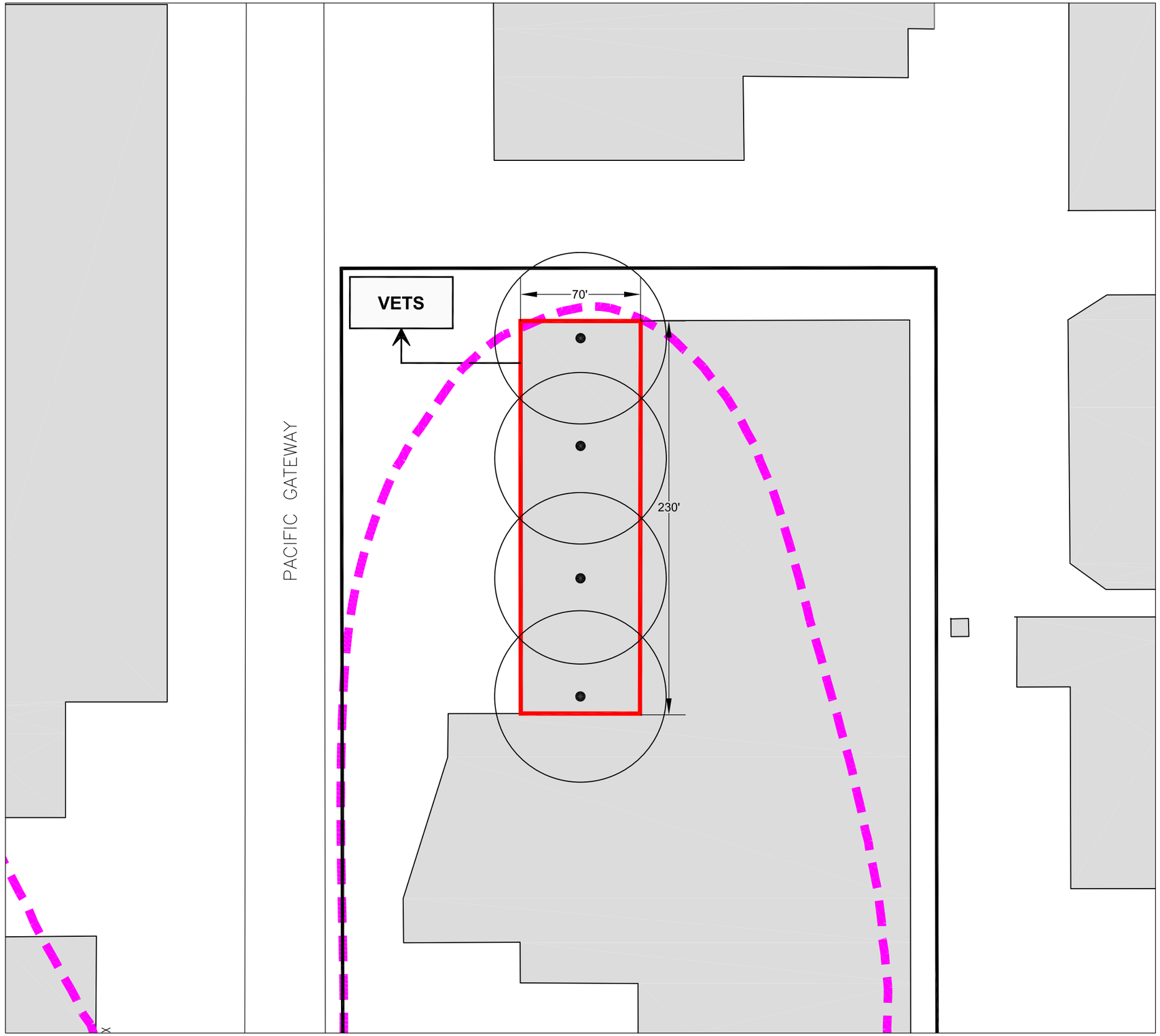

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- VETS — *Vapor Extraction Treatment System*
- *SVE/BV vertical well (70-foot spacing), circle denotes assumed 50-foot radius of influence*

N

0 60 120

Scale in Feet

FIGURE 7.7-2A

Alternative 3A
SOIL VAPOR EXTRACTION/BIOVENTING, ICS AND MONITORING
- VERTICAL WELLS
Parcel No. 7351-034-069

Source Area 4

URS

Del Amo Soil + NAPL FS

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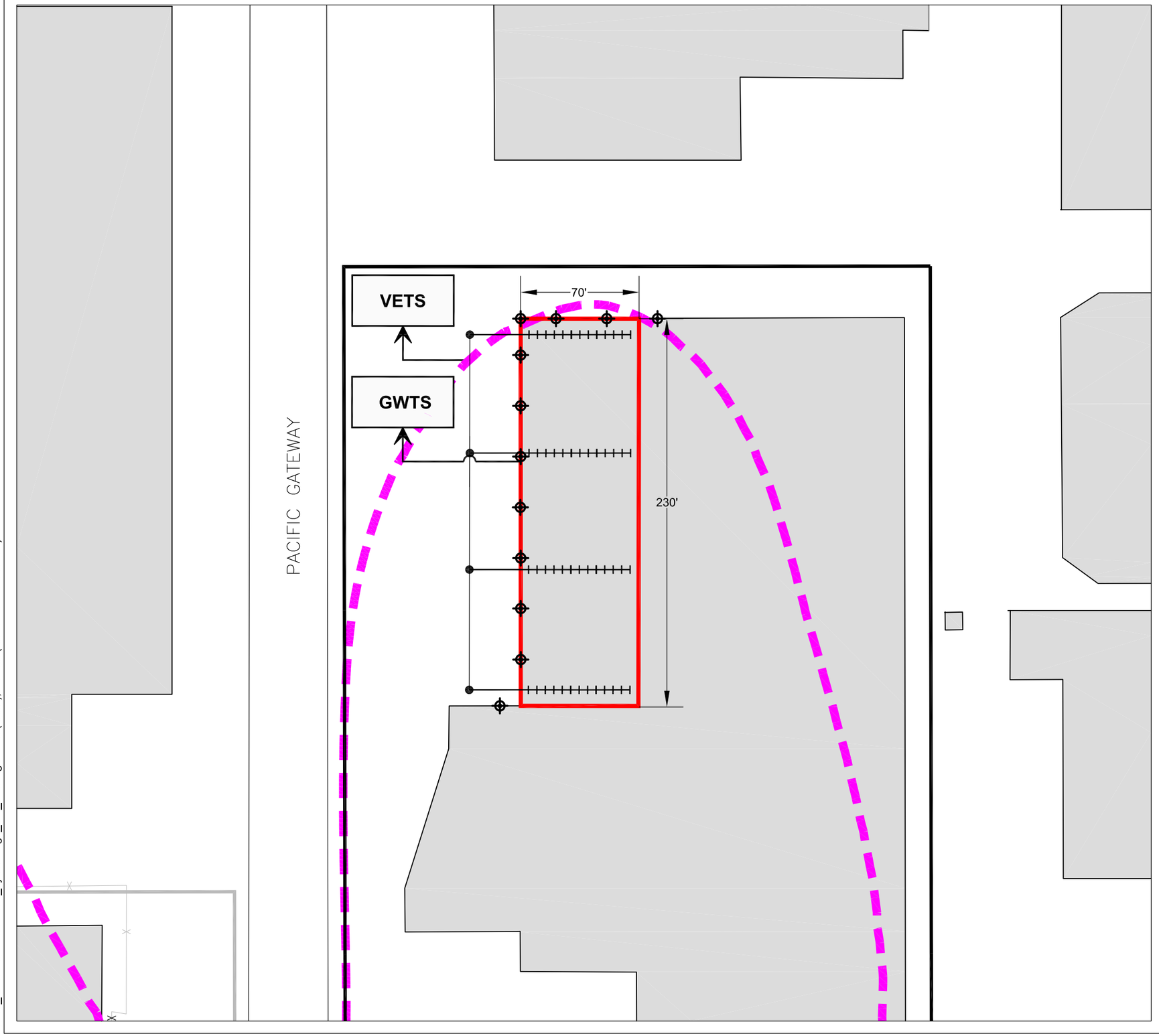

Legend

- *Assumed extent of NAPL source area based on benzene concentrations in one or more water table monitoring wells and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *Groundwater Extraction Well (30-foot spacing)*
- VETS — *Vapor Extraction Treatment System*
- GWTS — *Groundwater Treatment System*
- *Horizontal SVE/BV well (70-foot spacing) for deep soil under building (approximately 30-35 feet bgs)*

N

0 60 120

Scale in Feet

FIGURE 7.7-3

Alternative 4
HYDRAULIC EXTRACTION, SVE/BV (UB), ICS AND MONITORING - HORIZONTAL WELLS
Parcel No. 7351-034-069
Source Area 4
Del Amo Soil + NAPL FS

URS

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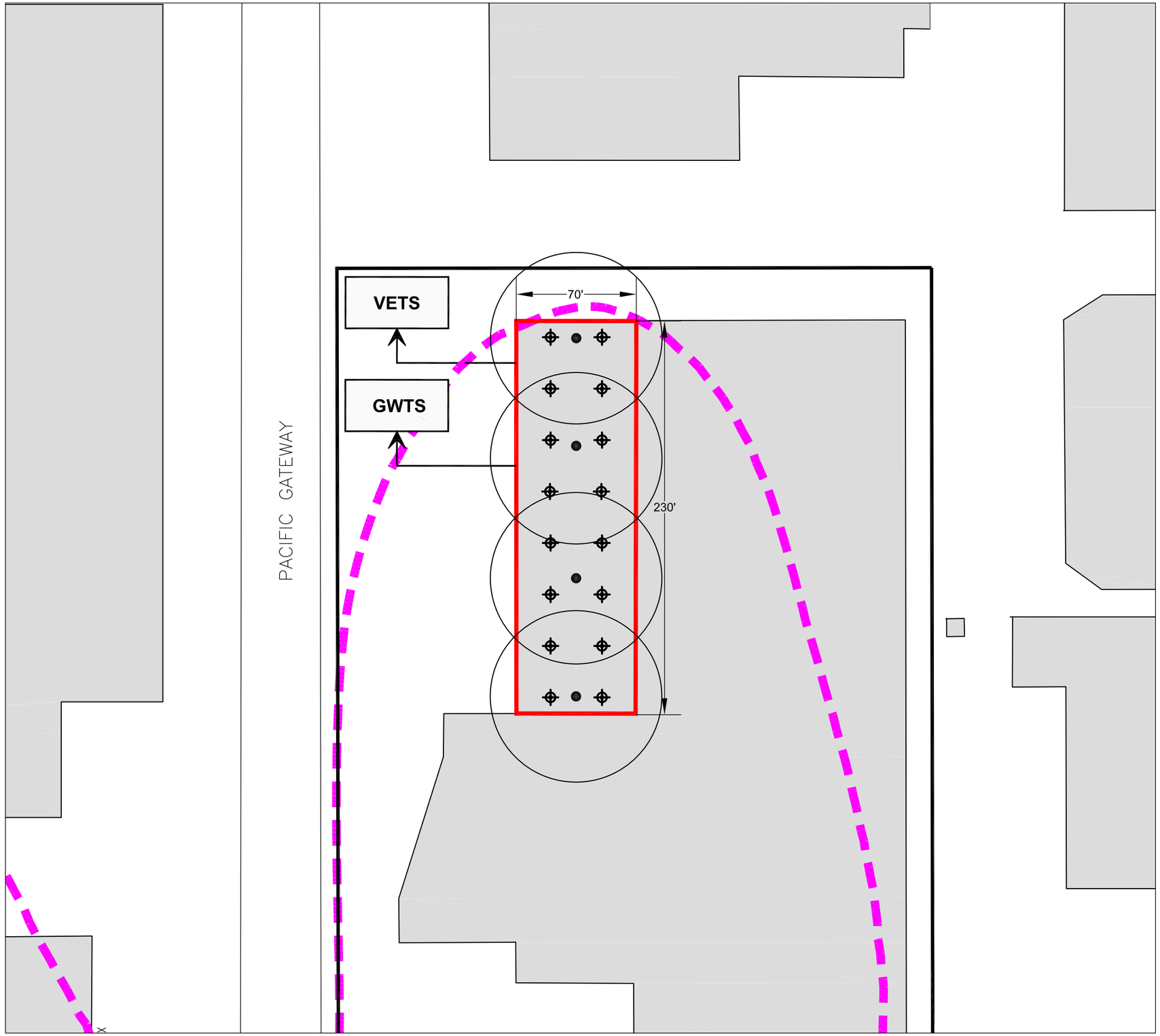

Legend

- Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities
- Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)
- Parcel boundary
- Groundwater Extraction Well (30-foot spacing)
- VETS — Vapor Extraction Treatment System
- GWTS — Groundwater Treatment System
- SVE/BV vertical well (approximately 70-foot spacing)

N

0 60 120

Scale in Feet

FIGURE 7.7-3A

Alternative 4A
HYDRAULIC EXTRACTION, SVE/BV (UB), ICS AND MONITORING
- VERTICAL WELLS
Parcel No. 7351-034-069

Source Area 4

URS

Del Amo Soil + NAPL FS

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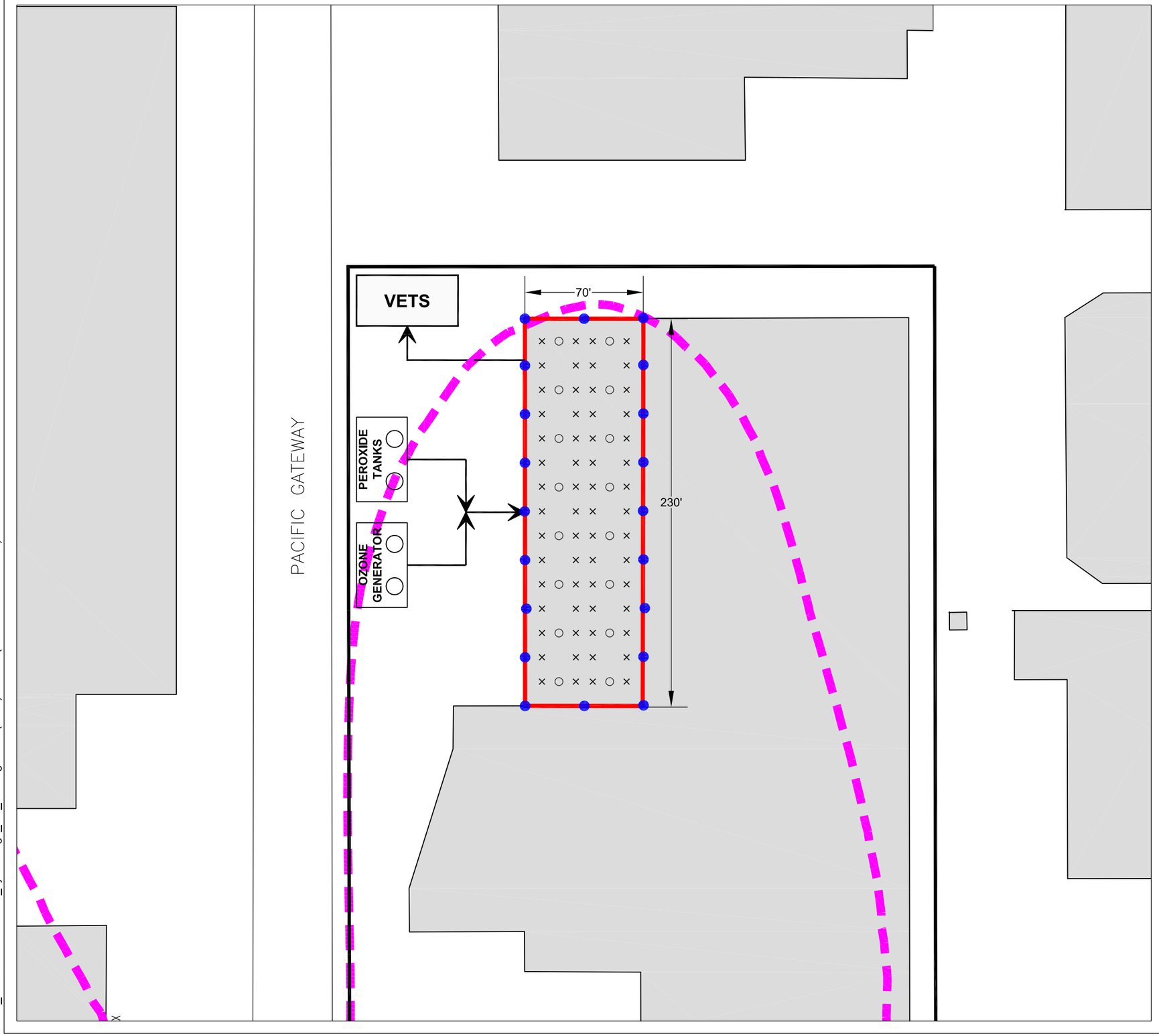

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- VETS — *Vapor Extraction Treatment System*
- × — *ISCO injection well (15-foot spacing)*
- ● — *SVE sentry well (30-foot spacing)*
- ○ — *SVE interior well, dual screen (30-foot spacing)*

Notes:

(1) Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.

(2) SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.

N

0 60 120

Scale in Feet

FIGURE 7.7-4

Alternative 5
IN-SITU CHEMICAL OXIDATION, SVE, ICS AND MONITORING

Parcel No. 7351-034-069
Source Area 4
Del Amo Soil + NAPL FS

URS

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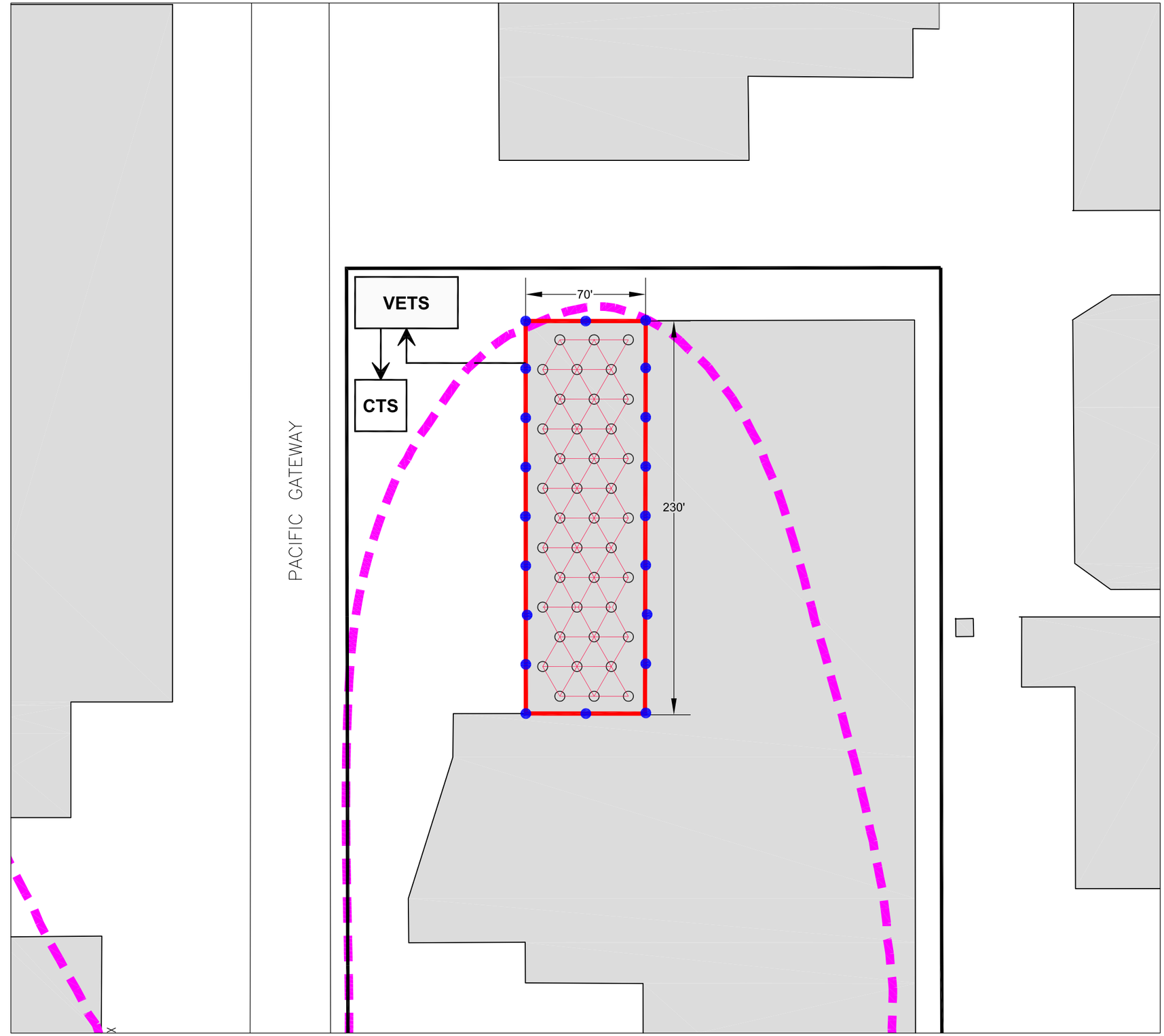

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *SVE sentry well (30-foot spacing)*
- *ERH electrode and SVE interior well, dual screen (20-foot spacing)*
- **VETS** — *Vapor Extraction Treatment System*
- **CTS** — *Condensate Treatment System*

Notes:

(1) Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.

(2) SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.

N

0 60 120

Scale in Feet

FIGURE 7.7-5

Alternative 6
IN-SITU SOIL HEATING, SVE, ICS AND MONITORING

Parcel No. 7351-034-069
Source Area 4
Del Amo Soil + NAPL FS

URS

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TABLE E.6-1
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 2
ICs + MONITORING COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	ICs Design, Documentation, Implementation	1	ls	$ 34,110	$ 34,110
				Direct Capital Total	**$ 34,000**
Item No.	**Indirect Capital Costs**				
1	Project Management	10%	of	$ 34,000	$ 3,400
				Indirect Capital Subtotal	**$ 3,400**
				Total Direct + Indirect Capital Cost	**$ 37,400**
Item No.	**Operation and Maintenance Costs**				
1	Institutional Controls, Inspections, Monitoring	1	year	$ 3,275	$ 3,275
2	Groundwater Monitoring	1	year	$ 15,000	$ 15,000
				ICs Annual Operation and Maintenance Subtotal	**$ 18,275**
				Present Worth of ICs Operation and Maintenance Costs (5%, 100 Years)	**$ 363,000**
				Contingency (20% of total project cost)	**$ 80,000**
				Total Capital and ICs O&M Cost	**$ 481,000**

NOTES/ASSUMPTIONS
1. ICs include IC layers 1, 2, 3, 4A and 5.
2. ICs capital and O&M costs are estimated based on applicable IC layers per parcel as shown in Tables D3-1 and D3-2.

TABLE E.6-2
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 3
SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 85,000	$ 85,000
2	Mobilization/Demobilization	16,100	sf	$ 1.25	$ 21,000
3	Electrical Service/Hookup/Utilities	1	ls	$ 20,000	$ 20,000
4	Site Preparation/Geophysical	16,100	sf	$ 0.8	$ 13,000
5	SVE Wells - Horizontal	4	ea	$ 25,000	$ 100,000
6	Well Headworks/Vault (24" traffic rated)	4	ea	$ 3,000	$ 12,000
7	VETS Installation and Startup	1	ls	$ 60,000	$ 60,000
8	SVE Blower + Thermal Oxidizer; 500 cfm	1	ls	$ 80,000	$ 80,000
9	Control and Instrumentation	1	ls	$ 6,000	$ 6,000
10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$ 10,000	$ 10,000
11	Trenching, Piping, Backfill and Resurfacing	500	lf	$ 30	$ 15,000
12	Equipment Pad/Enclosure/Fence	1	ea	$ 20,000	$ 20,000
13	Post Treatment Sampling + Analysis	7	borings	$ 7,000	$ 49,000
				Direct Capital Total	**$ 491,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	15%	of	$ 491,000	$ 74,000
2	Project Management, Agency Reporting/Coordination	8%	of	$ 491,000	$ 40,000
3	Contruction Management	10%	of	$ 491,000	$ 50,000
				Indirect Capital Subtotal	**$ 164,000**
				Total Direct + Indirect Capital Cost	**$ 655,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 9,000	$ 108,000
2	Electricity: SVE blower, misc equip	12	mths	$ 3,200	$ 38,400
3	Operations & Maintenance	12	mths	$ 5,000	$ 60,000
4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$ 1,000	$ 12,000
5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 4,000	$ 48,000
6	Project Management/Consultant support/Reports	12	mths	$ 4,000	$ 48,000
7	Waste/NAPL/Water Disposal	12	mths	$ 2,000	$ 24,000
8	Health & Safety/Air Monitoring	1	ls	$ 3,000	$ 3,000
9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 3,000	$ 36,000
				SVE Annual Operation and Maintenance Subtotal	**$ 378,000**
				SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)	**$ 1,341,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of SVE)	**$ 400,000**
				Total Capital and O&M Cost Present Worth	**$ 2,877,000**

NOTES/ASSUMPTIONS
1. Benzene SVE (UB) system: Uses 4 H-SVE wells with average 70 feet screens installed @ 30-35 feet bgs.
2. Vapor treatment system uses thermal oxidizer, 500 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.

TABLE E.6-2A
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 3A
SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 85,000	$ 85,000
2	Mobilization/Demobilization	16,100	sf	$ 1.25	$ 21,000
3	Electrical Service/Hookup/Utilities	1	ls	$ 20,000	$ 20,000
4	Site Preparation/Geophysical	16,100	sf	$ 0.8	$ 13,000
5	SVE Wells - Vertical	4	ea	$ 7,500	$ 30,000
6	Well Headworks/Vault (24" traffic rated)	4	ea	$ 3,000	$ 12,000
7	VETS Installation and Startup	1	ls	$ 60,000	$ 60,000
8	SVE Blower + Thermal Oxidizer; 200 cfm	1	ls	$ 65,000	$ 65,000
9	Control and Instrumentation	1	ls	$ 5,000	$ 5,000
10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$ 10,000	$ 10,000
11	Trenching, Piping, Backfill and Resurfacing	500	lf	$ 50	$ 25,000
12	Equipment Pad/Enclosure/Fence	1	ea	$ 25,000	$ 25,000
13	Post Treatment Sampling + Analysis	7	borings	$ 7,000	$ 49,000
				Direct Capital Total	**$ 420,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	15%	of	$ 420,000	$ 63,000
2	Project Management, Agency Reporting/Coordination	8%	of	$ 420,000	$ 34,000
3	Contruction Management	10%	of	$ 420,000	$ 42,000
				Indirect Capital Subtotal	**$ 139,000**
				Total Direct + Indirect Capital Cost	**$ 559,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 6,000	$ 72,000
2	Electricity: SVE blower, misc equip	12	mths	$ 1,700	$ 20,400
3	Operations & Maintenance	12	mths	$ 5,000	$ 60,000
4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$ 1,000	$ 12,000
5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 4,000	$ 48,000
6	Project Management/Consultant support/Reports	12	mths	$ 4,000	$ 48,000
7	Waste/NAPL/Water Disposal	12	mths	$ 2,000	$ 24,000
8	Health & Safety/Air Monitoring	1	ls	$ 3,000	$ 3,000
9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 3,000	$ 36,000
				SVE Annual Operation and Maintenance Subtotal	**$ 324,000**
				SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)	**$ 1,149,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of SVE)	**$ 342,000**
				Total Capital and O&M Cost Present Worth	**$ 2,531,000**

NOTES/ASSUMPTIONS
1. SVE (OS) system: Uses 4 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 200 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.

TABLE E.6-3
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 4
HYDRAULIC EXTRACTION AND SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 85,000	$ 85,000
2	Mobilization/Demobilization	16,100	sf	$ 1.25	$ 21,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical	16,100	sf	$ 0.8	$ 13,000
5	SVE Horizontal Wells	4	ea	$ 25,000	$ 100,000
6	Groundwater Extraction Wells	12	ea	$ 9,500	$ 114,000
7	Well Headworks/Vault/Extraction Pumps (24" traffic rated)	16	ea	$ 3,000	$ 48,000
8	Treatment System Installation and Startup (SVE + Hyd Ext)	1	ls	$ 120,000	$ 120,000
9	SVE Blower + Thermal Oxidizer; 750 cfm	1	ls	$ 100,000	$ 100,000
10	Control and Instrumentation	1	ls	$ 22,000	$ 22,000
11	Advanced Oxidation Treatment system (15 gpm) (HyPOx)	1	ls	$ 206,000	$ 206,000
12	Air Stripping Unit+Blower (STAT 30)	1	ls	$ 11,000	$ 11,000
13	Carbon Adsorption Vessels - VPGAC and LPGAC	4	ls	$ 10,000	$ 40,000
14	Misc Treat System: OWS, Tanks, Piping, Pumps	1	ls	$ 40,000	$ 40,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	1,000	lf	$ 50	$ 50,000
16	Equipment Pad/Enclosure/Fence	1	ea	$ 30,000	$ 30,000
17	Post Treatment Sampling + Analysis	7	borings	$ 7,000	$ 49,000
				Direct Capital Total	**$ 1,089,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 1,089,000	$ 131,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 1,089,000	$ 66,000
3	Contruction Management	8%	of	$ 1,089,000	$ 88,000
				Indirect Capital Subtotal	**$ 285,000**
				Total Direct+Indirect Cost	**$ 1,374,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel:Natural Gas (Thermal oxidizer)	12	mths	$ 12,000	$ 144,000
2	Electricity (SVE blower, HiPOx, Air Stripper blower)	12	mths	$ 9,400	$ 112,800
3	Operations & Maintenance	12	mths	$ 7,000	$ 84,000
4	Chemicals for HiPOx: H2O2	12	mths	$ 600	$ 7,200
5	Carbon - Liquid Phase	12	mths	$ 2,000	$ 24,000
6	Carbon - Vapor Phase (post-thermal/catox)	12	mths	$ 4,000	$ 48,000
7	Groundwater/Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 8,000	$ 96,000
8	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
9	Waste/NAPL/Water Disposal	12	mths	$ 4,000	$ 48,000
10	Health & Safety/Air Monitoring	1	ls	$ 6,000	$ 6,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 5,000	$ 60,000
				SVE Annual Operation and Maintenance Subtotal	**$ 410,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,454,000**
				Hydraulic Extraction Annual Operation and Maintenance Subtotal	**$ 317,000**
				Present Worth of Hydraulic Extraction Operation and Maintenance Costs (5%, 10 Years)	**$ 2,448,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of Hydraulic Extraction)	**$ 1,056,000**
				Total Capital and O&M Cost Present Worth	**$ 6,813,000**

NOTES/ASSUMPTIONS

1. Benzene SVE (UB) system: Uses 4 H-SVE wells with average 70 feet screens installed @ 30-35 feet bgs.
2. Vapor treatment system uses thermal oxidizer, 750 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. Hydraulic extraction system: Uses 12 groundwater extraction wells, 50-80 feet bgs screens with a max extraction flow rate of 12 gpm.
5. Water is treated by oil-water separator (OWS), APT's HiPOx (H2O2+Ozone) system and air stripping with discharge to storm drain.
6. Liquid phase carbon is used as a backup or polishing treatment process. Assumes 2 carbon changeouts per month.
7. Assume hydraulic extraction operation for 10 years.
8. Vapor phase carbon is used after SVE operation is completed to treat air stripper discharge. Assumes 1 carbon changeout/month.
9. Groundwater is extracted from UBF/MBF and some wells are expected to go dry.

TABLE E.6-3A
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 4A
HYDRAULIC EXTRACTION AND SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 85,000	$ 85,000
2	Mobilization/Demobilization	16,100	sf	$ 1.25	$ 21,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical	16,100	sf	$ 0.8	$ 13,000
5	SVE Vertical Wells	4	ea	$ 7,500	$ 30,000
6	Groundwater Extraction Wells	16	ea	$ 11,500	$ 184,000
7	Well Headworks/Vault/Extraction Pumps (24" traffic rated)	20	ea	$ 3,000	$ 60,000
8	Treatment System Installation and Startup (SVE + Hyd Ext)	1	ls	$ 120,000	$ 120,000
9	SVE Blower + Thermal Oxidizer; 500 cfm	1	ls	$ 80,000	$ 80,000
10	Control and Instrumentation	1	ls	$ 20,000	$ 20,000
11	Advanced Oxidation Treatment system (16 gpm) (HiPOx)	1	ls	$ 186,000	$ 186,000
12	Air Stripping Unit+Blower (STAT 30)	1	ls	$ 11,000	$ 11,000
13	Carbon Adsorption Vessels - VPGAC and LPGAC	4	ls	$ 10,000	$ 40,000
14	Misc Treat System: OWS, Tanks, Piping, Pumps	1	ls	$ 40,000	$ 40,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	1,600	lf	$ 50	$ 80,000
16	Equipment Pad/Enclosure/Fence	1	ea	$ 30,000	$ 30,000
17	Post Treatment Sampling + Analysis	7	borings	$ 7,000	$ 49,000
				Direct Capital Total	**$ 1,089,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 1,089,000	$ 131,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 1,089,000	$ 66,000
3	Contruction Management	8%	of	$ 1,089,000	$ 88,000
				Indirect Capital Subtotal	**$ 285,000**
				Total Direct+Indirect Cost	**$ 1,374,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel:Natural Gas (Thermal oxidizer)	12	mths	$ 9,000	$ 108,000
2	Electricity (SVE blower, HiPOx, Air Stripper blower)	12	mths	$ 8,300	$ 99,600
3	Operations & Maintenance	12	mths	$ 7,000	$ 84,000
4	Chemicals for HiPOx: H2O2	12	mths	$ 600	$ 7,200
5	Carbon - Liquid Phase	12	mths	$ 2,000	$ 24,000
6	Carbon - Vapor Phase (post-thermal/catox)	12	mths	$ 4,000	$ 48,000
7	Groundwater/Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 8,000	$ 96,000
8	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
9	Waste/NAPL/Water Disposal	12	mths	$ 4,000	$ 48,000
10	Health & Safety/Air Monitoring	1	ls	$ 6,000	$ 6,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 5,000	$ 60,000
				SVE Annual Operation and Maintenance Subtotal	**$ 368,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,305,000**
				Hydraulic Extraction Annual Operation and Maintenance Subtotal	**$ 310,000**
				Present Worth of Hydraulic Extraction Operation and Maintenance Costs (5%, 10 Years)	**$ 2,394,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of Hydraulic Extraction)	**$ 1,015,000**
				Total Capital and O&M Cost Present Worth	**$ 6,569,000**

NOTES/ASSUMPTIONS

1. SVE (OS) system: Uses 4 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 500 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. Hydraulic extraction system: Uses 16 groundwater extraction wells, 50-80 feet bgs screens with a max extraction flow rate of 16 gpm.
5. Water is treated by oil-water separator (OWS), APT's HiPOx (H2O2+Ozone) system and air stripping with discharge to storm drain.
6. Liquid phase carbon is used as a backup or polishing treatment process. Assumes 2 carbon changeouts per month.
7. Assume hydraulic extraction operation for 10 years.
8. Vapor phase carbon is used after SVE operation is completed to treat air stripper discharge. Assumes 1 carbon changeout/month.
9. Groundwater is extracted from UBF/MBF and some wells are expected to go dry.

TABLE E.6-4
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 5
IN-SITU CHEMICAL OXIDATION AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 200,000	$ 200,000
2	Mobilization/Demobilization	16,100	sf	$ 1.5	$ 25,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical survey	16,100	sf	$ 0.8	$ 13,000
5	Ozone / Peroxide Injection Well Points	180	ea	$ 4,800	$ 864,000
6	Vapor Extraction Interior Wells (Indoor)	16	ea	$ 7,500	$ 120,000
7	Vapor Extraction Sentry Wells (Indoor)	20	ea	$ 7,500	$ 150,000
8	Temperature Monitoring Points/Wells (Indoor)	4	ea	$ 12,000	$ 48,000
9	Well Headworks/Vault - Injection Wells (36-inch traffic rated)	60	ea	$ 4,000	$ 240,000
10	Well Headworks/Vault - SVE/Monit. Wells (24-inch traffic rated)	40	ea	$ 3,000	$ 120,000
11	Treatment System Installation and Startup	1	ls	$ 125,000	$ 125,000
12	Misc. Treatment Sys Equipment: tanks, piping..	1	ls	$ 50,000	$ 50,000
13	SVE Equipment : 750 CFM Blower+ThermOx	1	ls	$ 90,000	$ 90,000
14	Ozone Generation System, 40 ppd (air supply, generator, and manifold system)	1	units	$ 200,000	$ 200,000
15	Control and Instrumentation (includes ozone / peroxide distribution manifold and controls)	1	ls	$ 44,200	$ 45,000
16	Trenching, Piping, Backfill and Resurfacing	2,300	lf	$ 50	$ 115,000
17	Equipment Pad/Enclosure/Fence	1	ea	$ 40,000	$ 40,000
18	Post Treatment Sampling + Analysis	7	borings	$ 7,000	$ 49,000
				Direct Capital Total	**$ 2,534,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	8%	of	$ 2,534,000	$ 203,000
2	Project Management, Agency Reporting/Coordination	5%	of	$ 2,534,000	$ 127,000
3	Contruction Management	6%	of	$ 2,534,000	$ 153,000
				Indirect Capital Subtotal	**$ 483,000**
				Total Direct + Indirect Capital Cost	**$ 3,017,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal oxidizer)	12	mths	$ 12,000	$ 144,000
2	Electricity: (SVE Blower, Ozone Gen, misc electrical equip)	12	mths	$ 10,800	$ 129,600
3	SVE System Operation and Monitoring Labor	12	units	$ 8,000	$ 96,000
4	SVE Maintenance Materials and Expenses	12	mths	$ 3,000	$ 36,000
5	Chemicals: H2O2 (refer to note 5)	60	wells	$ 4,000	$ 240,000
6	ISCO Consultant Oversight	12	mths	$ 6,000	$ 72,000
7	SVE Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 4,000	$ 48,000
8	SVE / ISCO Soil and Groundwater Monitoring/Sampling Analytical Lab Costs (semi annually)	2	rounds	$ 50,000	$ 100,000
9	Project Management/Consultant support/Reports	12	mths	$ 6,000	$ 72,000
10	Waste Disposal	12	mths	$ 5,000	$ 60,000
11	H&S/Air Monitoring	1	ls	$ 8,000	$ 8,000
12	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 8,000	$ 96,000
				SVE Annual Operation and Maintenance Subtotal	**$ 567,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 2,011,000**
				ISCO Annual Operation and Maintenance Subtotal	**$ 536,000**
				Present Worth of ISCO Operation and Maintenance Costs (5%, 2 Years)	**$ 997,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ISCO)	**$ 2,410,000**
				Total Capital and O&M Cost Present Worth	**$ 8,916,000**

NOTES/ASSUMPTIONS

1. Assume 16 SVE wells with dual screens 15-30 and 30-50 feet bgs and 20 SVE sentry wells with 15-30 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 750 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. ISCO uses 60 direct push injection wells, each well a cluster of three 3/4"-SS injection points screened at 3 depths between 50-80 feet bgs.
5. Assume injection of 4,000 gal of 20% H2O2 per well for 2 year treatment for total of 240,000 gal of H2O2.
6. Assume injection of 300 lbs of O3 per well for 2 year treatment for total of 18,000 lbs. of O3.
7. Assume ISCO treatment system operates continuously for 2-year treatment with a 70% up time equivalent to 511 days.

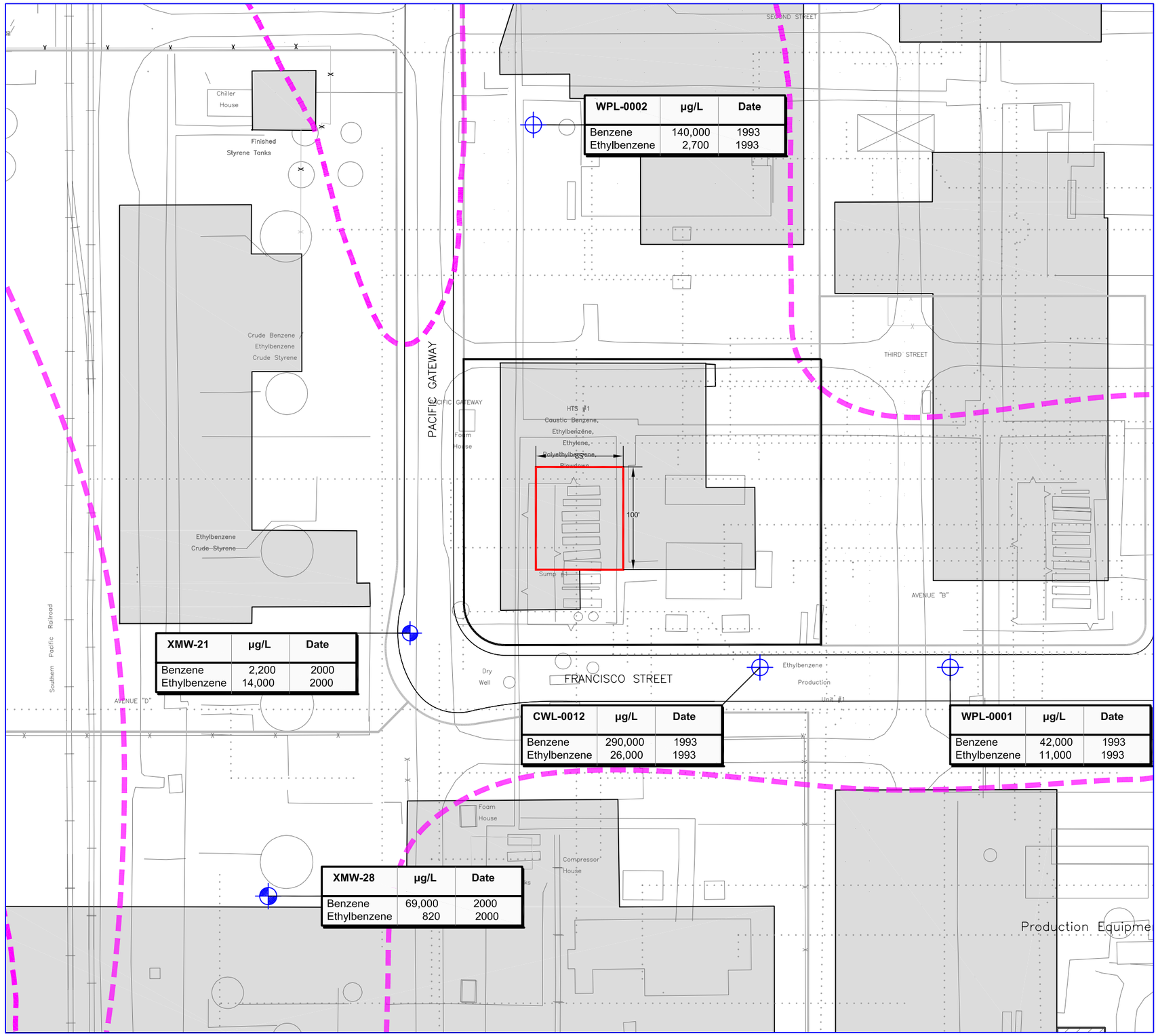
TABLE E.6-5
SOURCE AREA 4 - REMEDIAL ALTERNATIVE 6
IN-SITU SOIL HEATING AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 200,000	$ 200,000
2	Mobilization/Demobilization	16,100	sf	$ 1.5	$ 25,000
3	Electrical Service/Hookup 12kV, 60A, 3Φ	1	ls	$ 50,000	$ 50,000
4	Site Preparation/Geophysical	16,100	sf	$ 0.8	$ 13,000
5	Transformers/Power Controls	1	ls	$ 120,000	$ 120,000
6	Electrode/Vapor Extraction Wells	39	ea	$ 13,000	$ 507,000
7	Vapor Extraction Wells - Sentry	20	ea	$ 7,500	$ 150,000
8	Monitoring Wells	7	ea	$ 12,000	$ 84,000
9	Temperature Monitoring Points/Thermocouples	7	ea	$ 12,000	$ 84,000
10	Well Headworks/Vault (24" traffic rated)	73	ea	$ 3,000	$ 219,000
11	Treatment System Installation and Startup (Vapor and Liquid)	1	ls	$ 140,000	$ 140,000
12	High Vac Blower + Thermal Oxidizer; 2,500 scfm	1	unit	$ 140,000	$ 140,000
13	Control and Instrumentation	1	ls	$ 46,000	$ 46,000
14	Condensed Water Treatment System, 10 gpm (HiPOx, LPGAC)	1	ls	$ 210,000	$ 210,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	3,400	lf	$ 50	$ 170,000
16	Equipment Pad/Enclosure/Fence/Berms/Trailer	1	ea	$ 50,000	$ 50,000
17	PreTreatment Sampling+Analysis (Sampling during well installation)	1	ls	$ 100,000	$ 100,000
18	Post Treatment Sampling + Analysis	7	borings	$ 7,500	$ 52,500
				Direct Capital Total	**$ 2,361,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	8%	of	$ 2,361,000	$ 189,000
2	Project Management, Agency Reporting/Coordination	5%	of	$ 2,361,000	$ 119,000
3	Contruction Management	6%	of	$ 2,361,000	$ 142,000
				Indirect Capital Subtotal	**$ 450,000**
				Total Direct + Indirect Capital Cost	**$ 2,811,000**
Item No.	**Operation and Maintenance Cost**				
1	Electricity - ERH for soil heating	12	units	$ 44,700	$ 536,400
2	Electricity - SVE, HiPOx and misc elec equip	12	units	$ 16,300	$ 195,600
3	Operations & Maintenance	12	mths	$ 30,000	$ 360,000
4	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 33,000	$ 396,000
5	Liquid Phase Carbon	12	mths	$ 4,000	$ 48,000
6	Chemicals for water treatment: H2O2	12	mths	$ 375	$ 5,000
7	Labor - Groundwater/Vapor Treatment System Influent/Effluent Monitoring	12	mths	$ 15,000	$ 180,000
8	Project Management/Consultant Support/Reports	12	mths	$ 15,000	$ 180,000
9	Waste/NAPL/Water Disposal	12	mths	$ 6,000	$ 72,000
10	Health & Safety/Air Monitoring	12	mths	$ 8,000	$ 96,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 10,000	$ 120,000
				SVE + ERH Annual Operation and Maintenance Subtotal	**$ 2,189,000**
				Present Worth of SVE + ERH Operation and Maintenance Costs (5%, 2 Years)	**$ 4,071,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ERH)	**$ 2,753,000**
				Total Capital and O&M Cost Present Worth	**$ 10,116,000**

NOTES/ASSUMPTIONS

1. Assume 39 electrode SVE wells with dual conductive interval 25-50 and 50-80 ft bgs, dual-completed SVE with 15-30 and 30-50 ft bgs screens.
2. Assume 20 SVE sentry wells with 15-30 feet bgs screens.
3. Vapor treatment system uses thermal oxidizer, 2,500 scfm, positive displacement (PD) blower.
4. Condensate treatment system designed to treat 10 gpm using APT's HiPOx (H2O2+O3) system and LPGAC with discharge to storm drain.
5. Assume ERH+SVE operation for 2 years.
6. Assume average power usage of 298,000 KWhr/month and total electrical energy of 7.2 million KWhr for soil heating.
7. Assume system heating time on average of 50% of days in year.
8. Power conditioning unit (transformer) assumed to be rented.

SOURCE AREA 7



WPL-0002	µg/L	Date
Benzene	140,000	1993
Ethylbenzene	2,700	1993

XMW-21	µg/L	Date
Benzene	2,200	2000
Ethylbenzene	14,000	2000

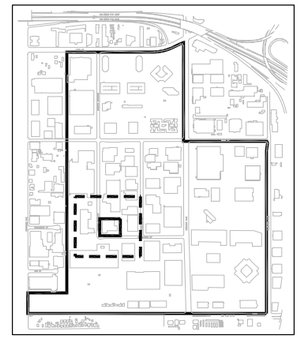
CWL-0012	µg/L	Date
Benzene	290,000	1993
Ethylbenzene	26,000	1993

WPL-0001	µg/L	Date
Benzene	42,000	1993
Ethylbenzene	11,000	1993

XMW-28	µg/L	Date
Benzene	69,000	2000
Ethylbenzene	820	2000

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Approximate location of former underground pipelines with a potential to have transported VOC-containing fluids*
- *Parcel boundary*
- *Outlines of historical features*
- *Monitoring well location in water table zone with contaminant concentration and date of sample*
- *Temporary well point with historical data*



Area shown in this map

N

0 100 200

Scale in Feet

FIGURE 7.8-1

ASSUMED EXTENT OF NAPL CONTAMINATION
Parcel No. 7351-034-052

Source Area 7
Del Amo Soil + NAPL FS

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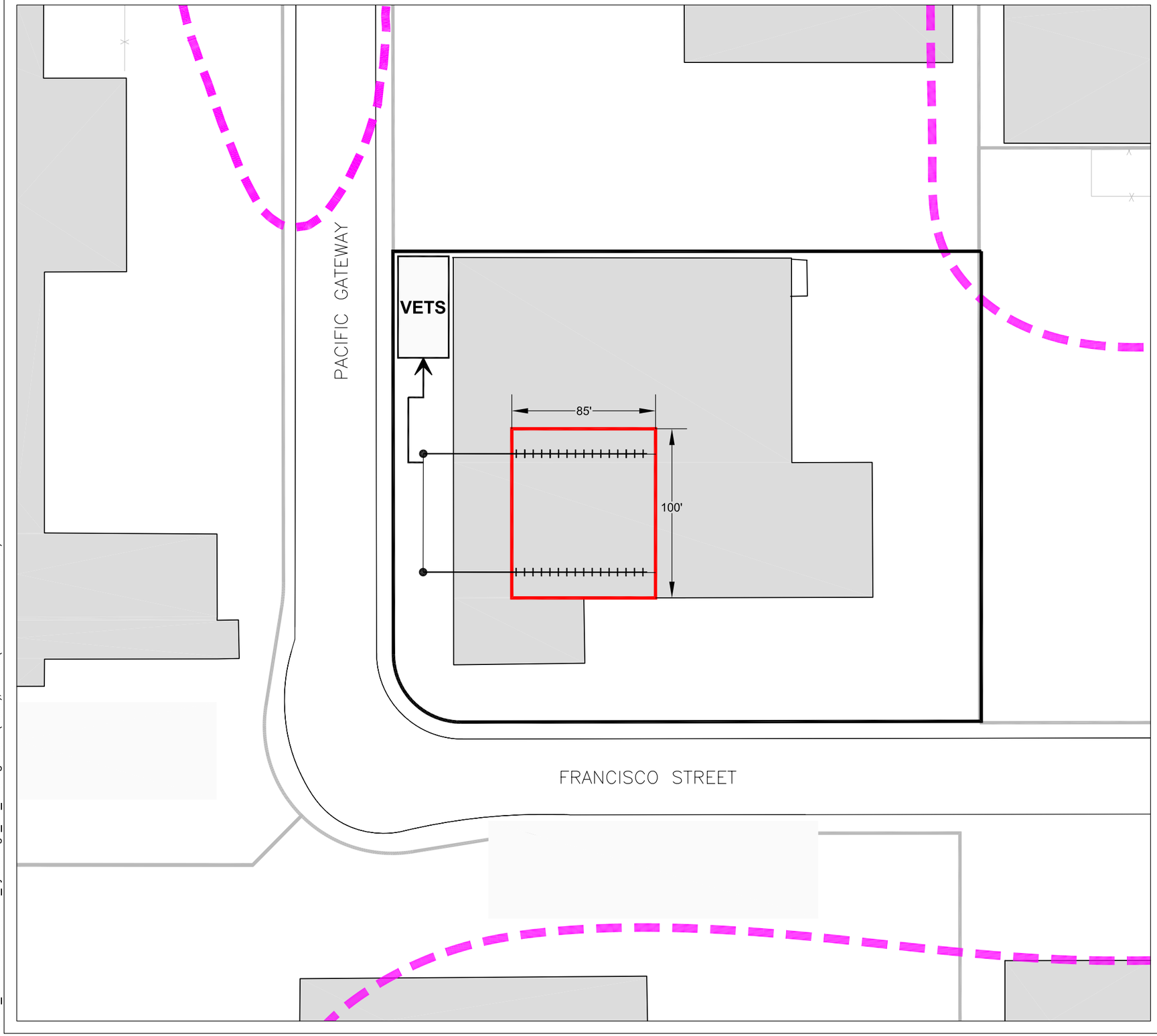

Legend

- *Assumed extent of NAPL source area based on benzene concentrations in one or more water table monitoring wells and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- VETS — *Vapor Extraction Treatment System*
- *Horizontal SVE/BV well (70-foot spacing) for deep soil under building (approximately 30-35 feet bgs)*

N

0 60 120

Scale in Feet

FIGURE 7.8-2

Alternative 3
SOIL VAPOR EXTRACTION/BIOVENTING (UB), ICS AND MONITORING
- HORIZONTAL WELLS
Parcel No. 7351-034-052
Source Area 7
Del Amo Soil + NAPL FS

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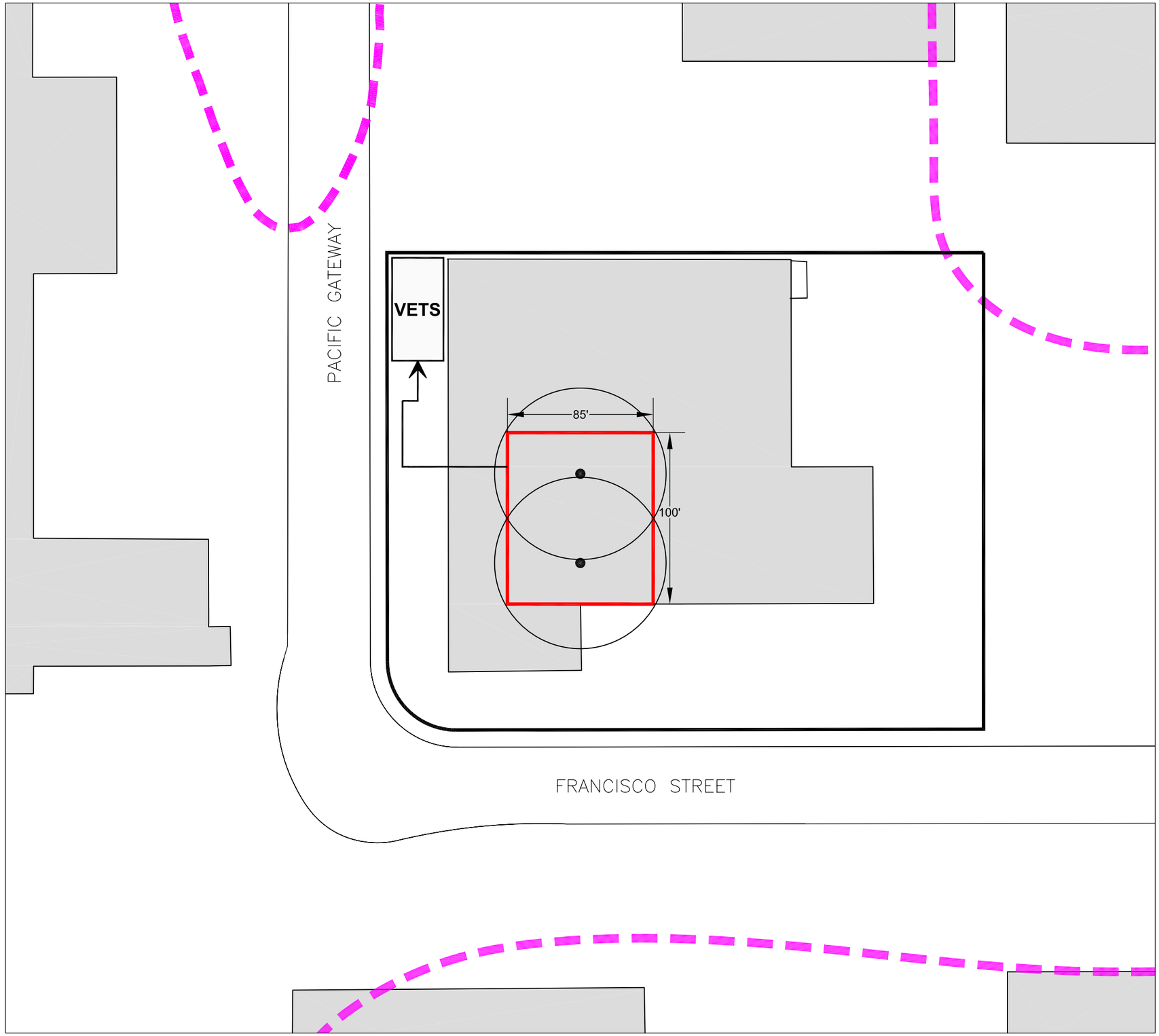

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- VETS — *Vapor Extraction Treatment System*
- *SVE/BV vertical well (70-foot spacing), circle denotes assumed 50-foot radius of influence*

N

0 60 120

Scale in Feet

FIGURE 7.8-2A

Alternative 3A
SOIL VAPOR EXTRACTION/BIOVENTING (UB), ICS AND MONITORING
- VERTICAL WELLS
Parcel No. 7351-034-052
Source Area 7
Del Amo Soil + NAPL FS

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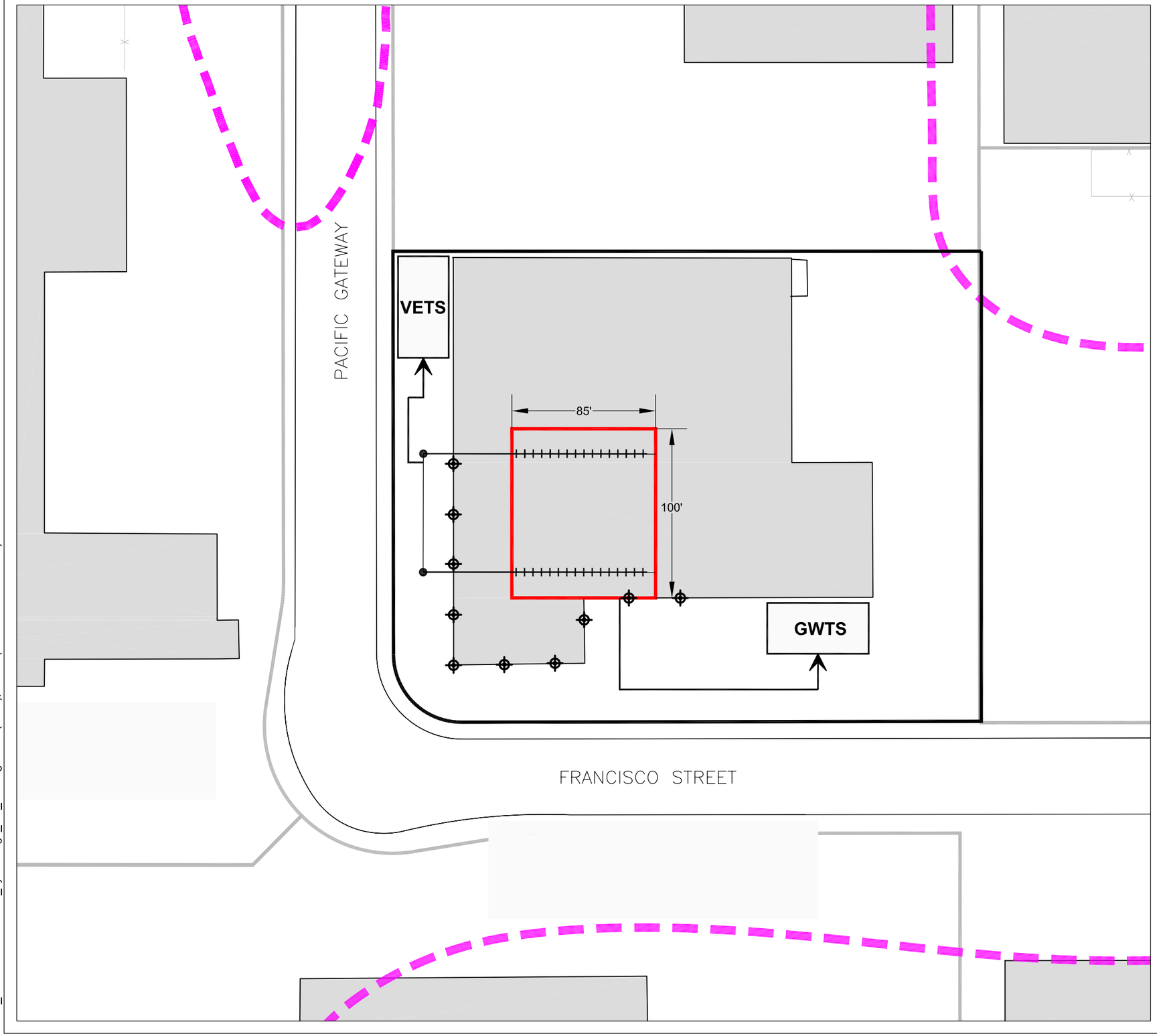

Legend

- *Assumed extent of NAPL source area based on benzene concentrations in one or more water table monitoring wells and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *Groundwater Extraction Well (30-foot spacing)*
- **VETS** — *Vapor Extraction Treatment System*
- **GWTS** — *Groundwater Treatment System*
- *Horizontal SVE/BV well (70-foot spacing) for deep soil under building (approximately 30-35 feet bgs)*

N

0 60 120

Scale in Feet

FIGURE 7.8-3

Alternative 4
HYDRAULIC EXTRACTION, SVE/BV (UB), ICS AND MONITORING
- HORIZONTAL WELLS
Parcel No. 7351-034-052
Source Area 7
Del Amo Soil + NAPL FS

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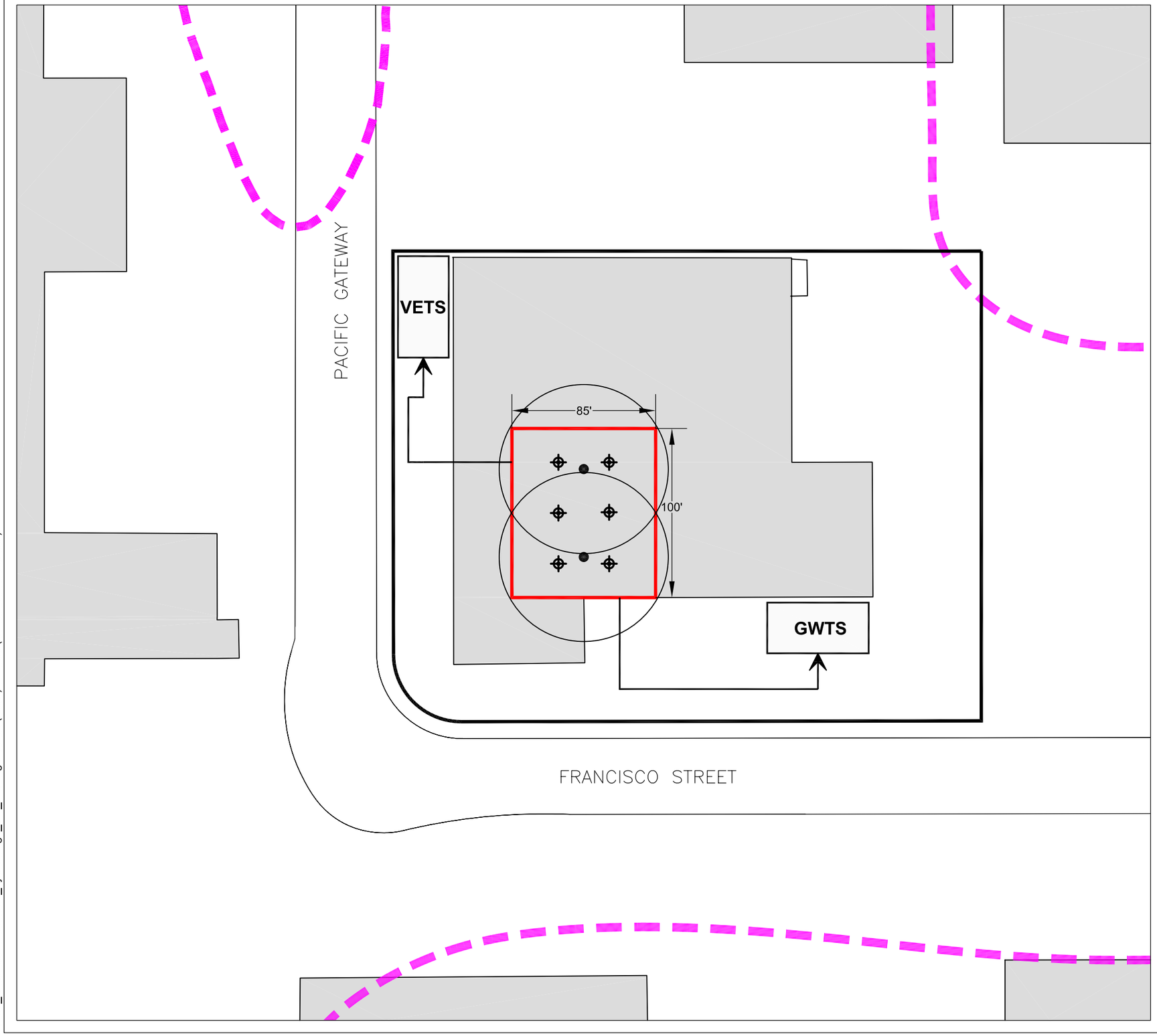

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- *Groundwater Extraction Well (30-foot spacing)*
- VETS — *Vapor Extraction Treatment System*
- GWTS — *Groundwater Treatment System*
- *SVE/BV vertical well (approximately 70-foot spacing).*

N

0 60 120

Scale in Feet

FIGURE 7.8-3A

Alternative 4A
HYDRAULIC EXTRACTION, SVE/BV (UB), ICS AND MONITORING
- VERTICAL WELLS
Parcel No. 7351-034-052

Source Area 7
Del Amo Soil + NAPL FS

URS

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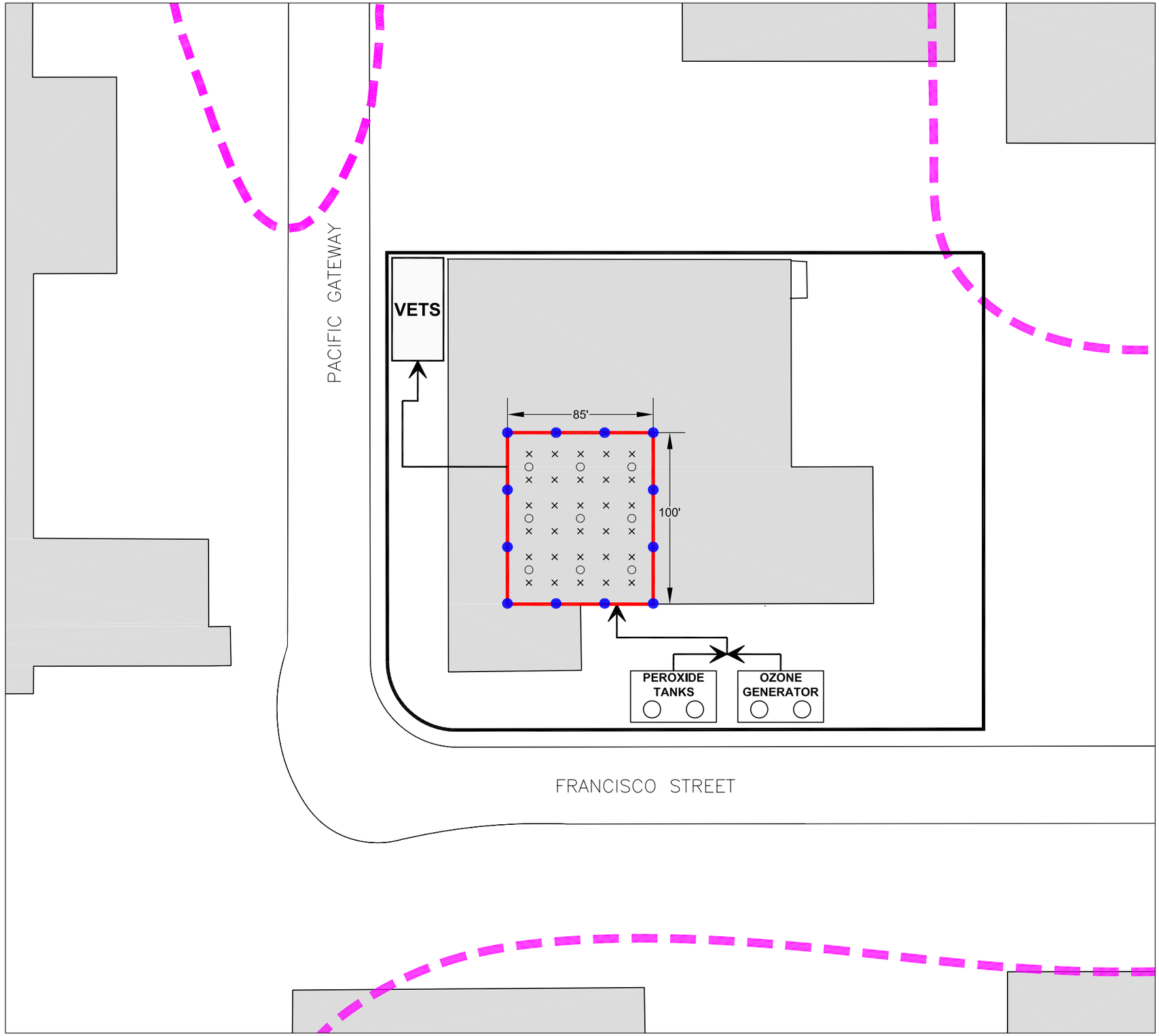

Legend

- *Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities*
- *Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)*
- *Parcel boundary*
- **VETS** — *Vapor Extraction Treatment System*
- × — *ISCO injection well (15-foot spacing)*
- ● — *SVE sentry well (30-foot spacing)*
- ○ — *SVE interior well, dual screen (30-foot spacing)*

Notes:

(1) Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.

(2) SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.

N

0 60 120

Scale in Feet

FIGURE 7.8-4

Alternative 5
IN-SITU CHEMICAL OXIDATION, SVE, ICS AND MONITORING

Parcel No. 7351-034-052
Source Area 7
Del Amo Soil + NAPL FS

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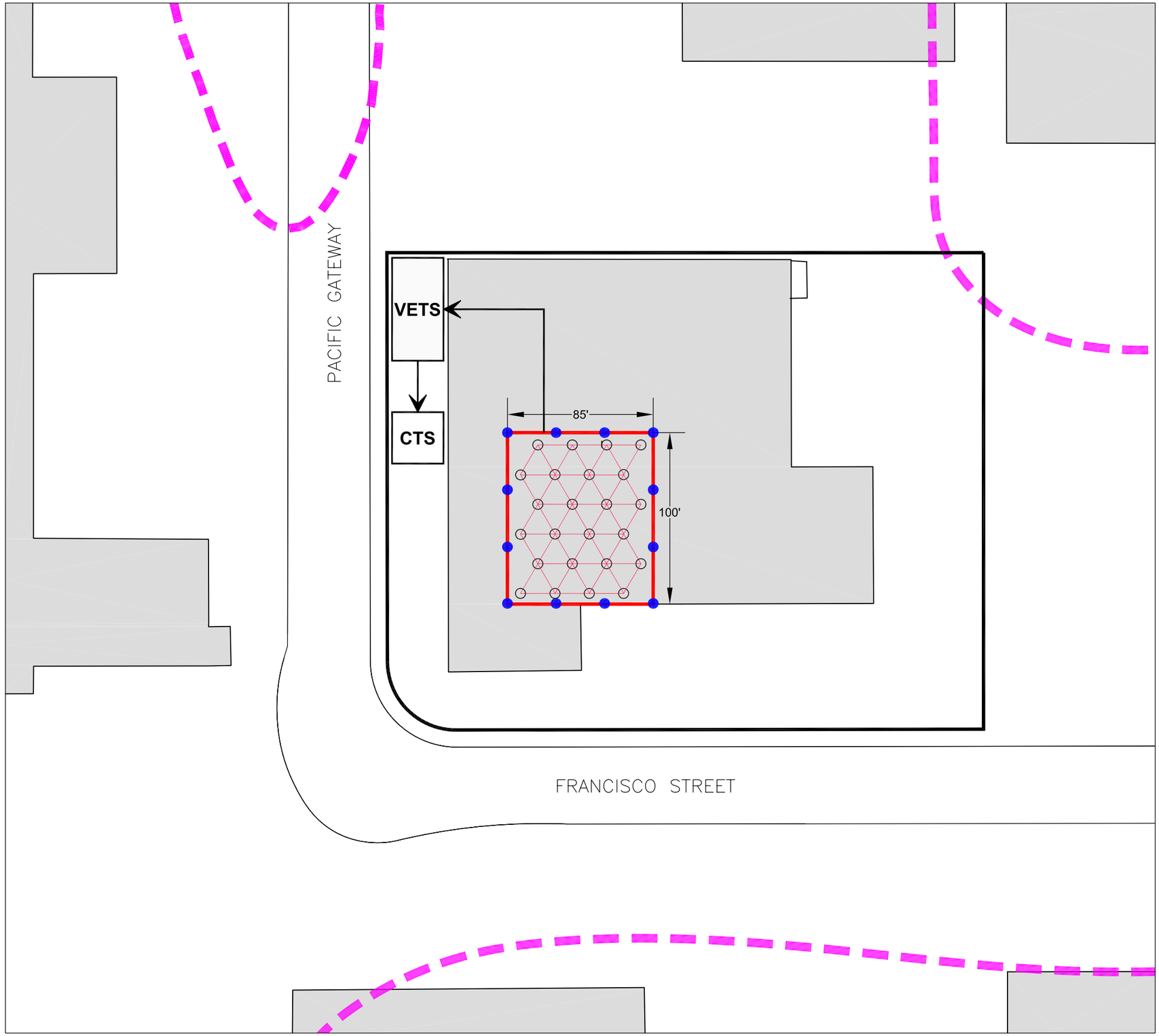

Legend

- Assumed extent of NAPL based on dissolved VOC concentrations and locations of former facilities
- Area where LNAPL could potentially be present based on dissolved concentrations in groundwater (>5% of solubility)
- Parcel boundary
- VETS — Vapor Extraction Treatment System
- SVE sentry well (30-foot spacing)
- ERH electrode and SVE interior well, dual screen (20-foot spacing)
- CTS — Condensate Treatment System

Notes:

(1) *Temperature monitoring points are not shown on the figure. These points would typically be distributed throughout the source area at a 50-75 foot spacing.*

(2) *SVE radius of influence circles are not shown for each well due to the large number of closely spaced wells in the figure.*

N

0 60 120

Scale in Feet

FIGURE 7.8-5

Alternative 6
IN-SITU SOIL HEATING, SVE, ICS AND MONITORING
Parcel No. 7351-034-052

Source Area 7
Del Amo Soil + NAPL FS

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TABLE E.7-1
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 2
ICs + MONITORING COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	ICs Design, Documentation, Implementation	1	ls	$ 34,110	$ 34,110
				Direct Capital Total	**$ 34,000**
Item No.	**Indirect Capital Costs**				
1	Project Management	10%	of	$ 34,000	$ 3,400
				Indirect Capital Subtotal	**$ 3,400**
				Total Direct + Indirect Capital Cost	**$ 37,400**
Item No.	**Operation and Maintenance Costs**				
1	Institutional Controls, Inspections, Monitoring	1	year	$ 3,275	$ 3,275
2	Groundwater Monitoring	1	year	$ 15,000	$ 15,000
				ICs Annual Operation and Maintenance Subtotal	**$ 18,275**
				Present Worth of ICs Operation and Maintenance Costs (5%, 100 Years)	**$ 363,000**
				Contingency (20% of total project cost)	**$ 80,000**
				Total Capital and ICs O&M Cost	**$ 481,000**

NOTES/ASSUMPTIONS
1. ICs include IC layers 1, 2, 3, 4A and 5.
2. ICs capital and O&M costs are estimated based on applicable IC layers per parcel as shown in Tables D3-1 and D3-2.

TABLE E.7-2
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 3
SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 54,000	$ 54,000
2	Mobilization/Demobilization	8,500	sf	$ 1.25	$ 11,000
3	Electrical Service/Hookup/Utilities	1	ls	$ 20,000	$ 20,000
4	Site Preparation/Geophysical	8,500	sf	$ 0.8	$ 7,000
5	SVE Wells	2	ea	$ 25,000	$ 50,000
6	Well Headworks/Vault (24" traffic rated)	2	ea	$ 3,000	$ 6,000
7	VETS Installation and Startup	1	ls	$ 50,000	$ 50,000
8	SVE Blower + Thermal Oxidizer; 400 cfm	1	ls	$ 80,000	$ 80,000
9	Control and Instrumentation	1	ls	$ 6,000	$ 6,000
10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$ 10,000	$ 10,000
11	Trenching, Piping, Backfill and Resurfacing	400	lf	$ 30	$ 12,000
12	Equipment Pad/Enclosure/Fence	1	ea	$ 20,000	$ 20,000
13	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 354,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	15%	of	$ 354,000	$ 54,000
2	Project Management, Agency Reporting/Coordination	8%	of	$ 354,000	$ 29,000
3	Contruction Management	10%	of	$ 354,000	$ 36,000
				Indirect Capital Subtotal	**$ 119,000**
				Total Direct + Indirect Capital Cost	**$ 473,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 8,000	$ 96,000
2	Electricity: SVE blower, misc equip	12	mths	$ 2,700	$ 32,400
3	Operations & Maintenance	12	mths	$ 4,500	$ 54,000
4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$ 2,000	$ 24,000
5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 3,000	$ 36,000
6	Project Management/Consultant support/Reports	12	mths	$ 4,000	$ 48,000
7	Waste/NAPL/Water Disposal	12	mths	$ 2,000	$ 24,000
8	Health & Safety/Air Monitoring	1	ls	$ 3,000	$ 3,000
9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 3,000	$ 36,000
				SVE Annual Operation and Maintenance Subtotal	**$ 354,000**
				SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)	**$ 1,256,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of SVE)	**$ 346,000**
				Total Capital and O&M Cost Present Worth	**$ 2,556,000**

NOTES/ASSUMPTIONS

1. Benzene SVE (UB) system: Uses 2 H-SVE wells with average 85 feet screens installed @ 30 feet bgs.
2. Vapor treatment system uses thermal oxidizer, 400 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.

TABLE E.7-2A
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 3A
SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 54,000	$ 54,000
2	Mobilization/Demobilization	8,500	sf	$ 1.25	$ 11,000
3	Electrical Service/Hookup/Utilities	1	ls	$ 20,000	$ 20,000
4	Site Preparation/Geophysical	8,500	sf	$ 0.8	$ 7,000
5	SVE Vertical Wells	2	ea	$ 7,500	$ 15,000
6	Well Headworks/Vault (24" traffic rated)	2	ea	$ 3,000	$ 6,000
7	VETS Installation and Startup	1	ls	$ 50,000	$ 50,000
8	SVE Blower + Thermal Oxidizer; 150 cfm	1	ls	$ 60,000	$ 60,000
9	Control and Instrumentation	1	ls	$ 5,000	$ 5,000
10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$ 10,000	$ 15,000
11	Trenching, Piping, Backfill and Resurfacing	200	lf	$ 50	$ 10,000
12	Equipment Pad/Enclosure/Fence	1	ea	$ 20,000	$ 20,000
13	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 301,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	15%	of	$ 301,000	$ 46,000
2	Project Management, Agency Reporting/Coordination	8%	of	$ 301,000	$ 25,000
3	Contruction Management	10%	of	$ 301,000	$ 31,000
				Indirect Capital Subtotal	**$ 102,000**
				Total Direct + Indirect Capital Cost	**$ 403,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 5,000	$ 60,000
2	Electricity: SVE blower, misc equip	12	mths	$ 1,500	$ 18,000
3	Operations & Maintenance	12	mths	$ 4,500	$ 54,000
4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$ 2,000	$ 24,000
5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 3,000	$ 36,000
6	Project Management/Consultant support/Reports	12	mths	$ 4,000	$ 48,000
7	Waste/NAPL/Water Disposal	12	mths	$ 2,000	$ 24,000
8	Health & Safety/Air Monitoring	1	ls	$ 3,000	$ 3,000
9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 3,000	$ 36,000
				SVE Annual Operation and Maintenance Subtotal	**$ 303,000**
				SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)	**$ 1,075,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of SVE)	**$ 296,000**
				Total Capital and O&M Cost Present Worth	**$ 2,255,000**

NOTES/ASSUMPTIONS
1. SVE (OS) system: Uses 2 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 150 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.

TABLE E.7-3
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 4
HYDRAULIC EXTRACTION AND SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 54,000	$ 54,000
2	Mobilization/Demobilization	8,500	sf	$ 1.25	$ 11,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical	8,500	sf	$ 0.8	$ 7,000
5	SVE Horizontal Wells	2	ea	$ 25,000	$ 50,000
6	Groundwater Extraction Wells	10	ea	$ 9,500	$ 95,000
7	Well Headworks/Vault/Extraction Pumps (24" traffic rated)	12	ea	$ 3,000	$ 36,000
8	Treatment System Installation and Startup (SVE + Hyd Ext)	1	ls	$ 100,000	$ 100,000
9	SVE Blower + Thermal Oxidizer; 500 cfm	1	ls	$ 80,000	$ 80,000
10	Control and Instrumentation	1	ls	$ 19,000	$ 19,000
11	Advanced Oxidation Treatment system (10 gpm) (HyPOx)	1	ls	$ 195,000	$ 195,000
12	Air Stripping Unit+Blower (STAT 30)	1	ls	$ 11,000	$ 11,000
13	Carbon Adsorption Vessels - VPGAC and LPGAC	4	ls	$ 10,000	$ 40,000
14	Misc Treat System: OWS, Tanks, Piping, Pumps	1	ls	$ 30,000	$ 30,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	600	lf	$ 50	$ 30,000
16	Equipment Pad/Enclosure/Fence	1	ea	$ 30,000	$ 30,000
17	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 856,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 856,000	$ 103,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 856,000	$ 52,000
3	Contruction Management	8%	of	$ 856,000	$ 69,000
				Indirect Capital Subtotal	**$ 224,000**
				Total Direct+Indirect Cost	**$ 1,080,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel:Natural Gas (Thermal oxidizer)	12	mths	$ 9,000	$ 108,000
2	Electricity (SVE blower, HiPOx, Air Stripper blower)	12	mths	$ 7,800	$ 93,600
3	Operations & Maintenance	12	mths	$ 7,000	$ 84,000
4	Chemicals for HiPOx: H2O2	12	mths	$ 375	$ 4,500
5	Carbon - Liquid Phase	12	mths	$ 2,000	$ 24,000
6	Carbon - Vapor Phase (post-thermal/catox)	12	mths	$ 2,000	$ 24,000
7	Groundwater/Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 6,500	$ 78,000
8	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
9	Waste/NAPL/Water Disposal	12	mths	$ 4,000	$ 48,000
10	Health & Safety/Air Monitoring	1	ls	$ 6,000	$ 6,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 5,000	$ 60,000
				SVE Annual Operation and Maintenance Subtotal	**$ 332,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,178,000**
				Hydraulic Extraction Annual Operation and Maintenance Subtotal	**$ 295,000**
				Present Worth of Hydraulic Extraction Operation and Maintenance Costs (5%, 10 Years)	**$ 2,278,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of Hydraulic Extraction)	**$ 908,000**
				Total Capital and O&M Cost Present Worth	**$ 5,925,000**

NOTES/ASSUMPTIONS

1. Benzene SVE (UB) system: Uses 2 H-SVE wells with average 85 feet screens installed @ 30-35 feet bgs.
2. Vapor treatment system uses thermal oxidizer, 500 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. Hydraulic extraction system: Uses 10 groundwater extraction wells, 40-80 feet bgs screens with a max extraction flow rate of 10 gpm.
5. Water is treated by oil-water separator (OWS), APT's HiPOx (H2O2+Ozone) system and air stripping with discharge to storm drain.
6. Liquid phase carbon is used as a backup or polishing treatment process. Assumes 2 carbon changeouts per month.
7. Assume hydraulic extraction operation for 10 years.
8. Vapor phase carbon is used after SVE operation is completed to treat air stripper discharge. Assumes 1 carbon changeout/month.
9. Groundwater is extracted from UBF/MBF and some wells are expected to go dry.

TABLE E.7-3A
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 4A
HYDRAULIC EXTRACTION AND SVE/BV COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 54,000	$ 54,000
2	Mobilization/Demobilization	8,500	sf	$ 1.25	$ 11,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical	8,500	sf	$ 0.8	$ 7,000
5	SVE Vertical Wells	2	ea	$ 7,500	$ 15,000
6	Groundwater Extraction Wells	6	ea	$ 11,500	$ 69,000
7	Well Headworks/Vault/Extraction Pumps (24" traffic rated)	8	ea	$ 3,000	$ 24,000
8	Treatment System Installation and Startup (SVE + Hyd Ext)	1	ls	$ 100,000	$ 100,000
9	SVE Blower + Thermal Oxidizer; 300 cfm	1	ls	$ 75,000	$ 75,000
10	Control and Instrumentation	1	ls	$ 19,000	$ 19,000
11	Advanced Oxidation Treatment system (6 gpm) (HiPOx)	1	ls	$ 195,000	$ 195,000
12	Air Stripping Unit+Blower (STAT 30)	1	ls	$ 11,000	$ 11,000
13	Carbon Adsorption Vessels - VPGAC and LPGAC	4	ls	$ 10,000	$ 40,000
14	Misc Treat System: OWS, Tanks, Piping, Pumps	1	ls	$ 30,000	$ 30,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	400	lf	$ 50	$ 20,000
16	Equipment Pad/Enclosure/Fence	1	ea	$ 50,000	$ 50,000
17	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 788,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 788,000	$ 95,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 788,000	$ 48,000
3	Contruction Management	8%	of	$ 788,000	$ 64,000
				Indirect Capital Subtotal	**$ 207,000**
				Total Direct+Indirect Cost	**$ 995,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel:Natural Gas (Thermal oxidizer)	12	mths	$ 7,000	$ 84,000
2	Electricity (SVE blower, HiPOx, Air Stripper blower)	12	mths	$ 6,500	$ 78,000
3	Operations & Maintenance	12	mths	$ 7,000	$ 84,000
4	Chemicals for HiPOx: H2O2	12	mths	$ 375	$ 4,500
5	Carbon - Liquid Phase	12	mths	$ 2,000	$ 24,000
6	Carbon - Vapor Phase (post-thermal/catox)	12	mths	$ 2,000	$ 24,000
7	Groundwater/Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 6,500	$ 78,000
8	Project Management/Consultant support/Reports	12	mths	$ 8,000	$ 96,000
9	Waste/NAPL/Water Disposal	12	mths	$ 4,000	$ 48,000
10	Health & Safety/Air Monitoring	1	ls	$ 6,000	$ 6,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 5,000	$ 60,000
				SVE Annual Operation and Maintenance Subtotal	**$ 300,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,064,000**
				Hydraulic Extraction Annual Operation and Maintenance Subtotal	**$ 288,000**
				Present Worth of Hydraulic Extraction Operation and Maintenance Costs (5%, 10 Years)	**$ 2,224,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (20% of Hydraulic Extraction)	**$ 857,000**
				Total Capital and O&M Cost Present Worth	**$ 5,621,000**

NOTES/ASSUMPTIONS

1. SVE (OS) system: Uses 2 V-SVE wells, 30-50 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 300 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. Hydraulic extraction system: Uses 6 groundwater extraction wells, 40-80 feet bgs screens with a max extraction flow rate of 6 gpm.
5. Water is treated by oil-water separator (OWS), APT's HiPOx (H2O2+Ozone) system and air stripping with discharge to storm drain.
6. Liquid phase carbon is used as a backup or polishing treatment process. Assumes 2 carbon changeouts per month.
7. Assume hydraulic extraction operation for 10 years.
8. Vapor phase carbon is used after SVE operation is completed to treat air stripper discharge. Assumes 1 carbon changeout/month.
9. Groundwater is extracted from UBF/MBF and some wells are expected to go dry.

TABLE E.7-4
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 5
IN-SITU CHEMICAL OXIDATION AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 125,000	$ 125,000
2	Mobilization/Demobilization	8,500	sf	$ 1.5	$ 13,000
3	Electrical Service/Hookup	1	ls	$ 40,000	$ 40,000
4	Site Preparation/Geophysical survey	8,500	sf	$ 0.8	$ 7,000
5	Chemical Injection Points/Wells	90	ea	$ 4,800	$ 432,000
6	Vapor Extraction Wells (Interior)	9	ea	$ 7,500	$ 67,500
7	Vapor Extraction Wells (Sentry)	12	ea	$ 7,500	$ 90,000
8	Monitoring Wells/Temp Mon Points	4	ea	$ 12,000	$ 48,000
9	Well Headworks/Vault - Injection Wells (36-inch traffic rated)	30	ea	$ 4,000	$ 120,000
10	Well Headworks/Vault - SVE/Monit. Wells (24-inch traffic rated)	25	ea	$ 3,000	$ 75,000
11	Treatment System Installation and Startup	1	ls	$ 100,000	$ 100,000
12	Misc. Treatment Sys Equipment: tanks, piping..	1	ls	$ 40,000	$ 40,000
13	SVE Equipment : 500 CFM Blower+ThermOx	1	ls	$ 80,000	$ 80,000
14	Ozone Generation System, 20 ppd (air supply, generator, and manifold system)	1	units	$ 120,000	$ 120,000
15	Control and Instrumentation (includes ozone / peroxide distribution manifold and controls)	1	ls	$ 31,200	$ 32,000
16	Trenching, Piping, Backfill and Resurfacing	900	lf	$ 50	$ 45,000
17	Equipment Pad/Enclosure/Fence	1	ea	$ 40,000	$ 40,000
18	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 1,503,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	8%	of	$ 1,503,000	$ 121,000
2	Project Management, Agency Reporting/Coordination	5%	of	$ 1,503,000	$ 76,000
3	Contruction Management	6%	of	$ 1,503,000	$ 91,000
				Indirect Capital Subtotal	**$ 288,000**
				Total Direct + Indirect Capital Cost	**$ 1,791,000**
Item No.	**Operation and Maintenance Cost**				
1	Fuel: Natural Gas (Thermal oxidizer)	12	mths	$ 9,000	$ 108,000
2	Electricity: (SVE Blower, Ozone Gen, misc electrical equip)	12	mths	$ 9,600	$ 115,200
3	SVE System Operation and Monitoring Labor	12	units	$ 8,000	$ 96,000
4	SVE Maintenance Materials and Expenses	12	mths	$ 3,000	$ 36,000
5	Chemicals: H2O2 (refer to note 5)	30	wells	$ 4,000	$ 120,000
6	ISCO Consultant Oversight	12	mths	$ 6,000	$ 72,000
7	SVE Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$ 4,000	$ 48,000
8	SVE / ISCO Soil and Groundwater Monitoring/Sampling Analytical Lab Costs (semi annually)	2	rounds	$ 35,000	$ 70,000
9	Project Management/Consultant support/Reports	12	mths	$ 6,000	$ 72,000
10	Waste Disposal	12	mths	$ 5,000	$ 60,000
11	H&S/Air Monitoring	1	ls	$ 8,000	$ 8,000
12	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 8,000	$ 96,000
				SVE Annual Operation and Maintenance Subtotal	**$ 507,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)	**$ 1,798,000**
				ISCO Annual Operation and Maintenance Subtotal	**$ 395,000**
				Present Worth of ISCO Operation and Maintenance Costs (5%, 2 Years)	**$ 735,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ISCO)	**$ 1,730,000**
				Total Capital and O&M Cost Present Worth	**$ 6,535,000**

NOTES/ASSUMPTIONS

1. Assume 9 SVE wells with dual screens 15-30 and 30-50 feet bgs and 12 SVE sentry wells with 15-30 feet bgs screens.
2. Vapor treatment system uses thermal oxidizer, 500 scfm, positive displacement (PD) blower.
3. Assume SVE operation for 4 years.
4. ISCO uses 30 direct push injection wells, each well a cluster of three 3/4"-SS injection points screened at 3 depths between 50-80 feet bgs.
5. Assume injection of 4,000 gal of 20% H2O2 per well for 2 year treatment for total of 120,000 gal of H2O2.
6. Assume injection of 300 lbs of O3 per well for 2 year treatment for total of 9,000 lbs. of O3.
7. Assume ISCO treatment system operates continuously for 2-year treatment with a 70% up time equivalent to 511 days.

TABLE E.7-5
SOURCE AREA 7 - REMEDIAL ALTERNATIVE 6
IN-SITU SOIL HEATING AND SVE COST ESTIMATE
Soil and NAPL FS
Del Amo Superfund Site

Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost
Item No.	**Direct Capital Costs**				
1	Site Investigation/Delineation	1	ls	$ 125,000	$ 125,000
2	Mobilization/Demobilization	8,500	sf	$ 1.5	$ 13,000
3	Electrical Service/Hookup 12kV, 60A, 3Φ	1	ls	$ 50,000	$ 50,000
4	Site Preparation/Geophysical	8,500	sf	$ 0.8	$ 7,000
5	Transformers/Power Controls	1	ls	$ 120,000	$ 120,000
6	Electrode/Vapor Extraction Wells	24	ea	$ 13,000	$ 312,000
7	Vapor Extraction Wells - Sentry	12	ea	$ 7,500	$ 90,000
8	Monitoring Wells	4	ea	$ 12,000	$ 48,000
9	Temperature Monitoring Points/Thermocouples	4	ea	$ 12,000	$ 48,000
10	Well Headworks/Vault (24" traffic rated)	44	ea	$ 3,000	$ 132,000
11	Treatment System Installation and Startup (Vapor and Liquid)	1	ls	$ 120,000	$ 120,000
12	High Vac Blower + Thermal Oxidizer; 1,500 cfm	1	unit	$ 130,000	$ 130,000
13	Control and Instrumentation	1	ls	$ 45,000	$ 45,000
14	Condensed Water Treatment System, 10 gpm (HiPOx, LPGAC)	1	ls	$ 210,000	$ 210,000
15	Trenching, Piping, Cables, Backfill and Resurfacing	1,100	lf	$ 50	$ 55,000
16	Equipment Pad/Enclosure/Fence/Berms/Trailer	1	ea	$ 50,000	$ 50,000
17	PreTreatment Sampling+Analysis (Sampling during well installation)	1	ls	$ 50,000	$ 50,000
18	Post Treatment Sampling + Analysis	4	borings	$ 7,000	$ 28,000
				Direct Capital Total	**$ 1,633,000**
Item No.	**Indirect Capital Costs**				
1	Engineering, Design, and Permitting	12%	of	$ 1,633,000	$ 196,000
2	Project Management, Agency Reporting/Coordination	6%	of	$ 1,633,000	$ 98,000
3	Contruction Management	8%	of	$ 1,633,000	$ 131,000
				Indirect Capital Subtotal	**$ 425,000**
				Total Direct + Indirect Capital Cost	**$ 2,058,000**
Item No.	**Operation and Maintenance Cost**				
1	Electricity - ERH for soil heating	12	units	$ 24,000	$ 288,000
2	Electricity - SVE, HiPOx and misc elec equip	12	units	$ 11,200	$ 134,400
3	Operations & Maintenance	12	mths	$ 30,000	$ 360,000
4	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$ 21,000	$ 252,000
5	Liquid Phase Carbon	12	mths	$ 4,000	$ 48,000
6	Chemicals for water treatment: H2O2	12	mths	$ 375	$ 5,000
7	Labor - Groundwater/Vapor Treatment System Influent/Effluent Monitoring	12	mths	$ 12,000	$ 144,000
8	Project Management/Consultant Support/Reports	12	mths	$ 12,000	$ 144,000
9	Waste/NAPL/Water Disposal	12	mths	$ 6,000	$ 72,000
10	Health & Safety/Air Monitoring	12	mths	$ 8,000	$ 96,000
11	Miscellaneous: Equipment rentals, PID/FID	12	mths	$ 10,000	$ 120,000
				SVE + ERH Annual Operation and Maintenance Subtotal	**$ 1,664,000**
				Present Worth of SVE Operation and Maintenance Costs (5%, 2 Years)	**$ 3,095,000**
				Present Worth of ICs + Monitoring (5%, 100 Years) Costs	**$ 481,000**
				Contingency (40% of ERH)	**$ 2,062,000**
				Total Capital and O&M Cost Present Worth	**$ 7,696,000**

NOTES/ASSUMPTIONS

1. Assume 24 electrode SVE wells with dual conductive interval 25-50 and 50-80 ft bgs, dual-completed SVE with 15-30 and 30-50 ft bgs screens.
2. Assume 12 SVE sentry wells with 15-30 feet bgs screens.
3. Vapor treatment system uses thermal oxidizer, 1,500 scfm, positive displacement (PD) blower.
4. Condensate treatment system designed to treat 10 gpm using APT's HiPOx (H2O2+O3) system and LPGAC with discharge to storm drain.
5. Assume ERH+SVE operation for 2 years.
6. Assume average power usage of 158,000 KWhr/month and total electrical energy of 3.9 million KWhr for soil heating.
7. Assume system heating time on average of 50% of days in year.
8. Power conditioning unit (transformer) assumed to be rented.